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ORIGINAL COMMUNICATIONS.

The Importance of Education to Farmers. By Henry Colman. [For the New-York Farmer, and American Gardener's Magazine.]

The station in the community occupied by the agricultural class, is commanding and important. In every country of any considerable extent, they constitute the most numerous part of the population; and that upon which all others ultimately depend. The products of agriculture are the first form of wealth; and without the labors of the husbandman, every other occupation must cease. Where agriculture has been extensively carried on, and estates are large, there the planter or landholder has generally held a high political estimation; and exercised all the influence to which he could justly aspire. In England, the nobles and barons, in Europe, the feudal lords and princes, and in our own country, the southern planters, have maintained a high rank, and wielded a powerful control in the affairs of the country. These individuals, however, scarcely deserved to be classed with the agricultural population, since, with some few occasional but most honorable exceptions, they have seldom taken any immediate interest in agriculture, properly so called, or entered into its details farther than to receive its rents; and then, we should be happy if truth did not compel us to add, have looked with disdain and scorn upon the actual tillers of the soil, those whose severe toil furnished them the means of subsistence, luxury, and wealth.

In our own country, in those parts of it where free labor only is known, and where, especially as in New-England, the land is greatly subdivided into innumerable and comparatively very small freeholds, and the owners are themselves the actual cultivators of the soil; there the farmers, though not a degraded class, have yet failed to have that place in the public estimation, and that influence in the public concerns, to which, as a class, the part they perform, and the contributions they render to the public weal, entitle them. The professional man, the merchant, the trader, the tavern-keeper, the manufacturer, and the mechanic, take precedence of the farmer; and feel at liberty, unless he has about him the artificial insignia of some office, to look down upon him. To this law of rank, if so it may be called, the farmer, in general, submits without remonstrance or complaint, and consents to see even the shiftless, idle, and dissolute, who live only to consume the fruits of the earth, and take no share of the public burthens, and contribute not a whit to the substantial welfare or real improvement of the community, preferred before him.

Now, do we wish to excite in the farmers a foolish ambition? Do we desire to make them eager after distinctions, which have no substantial importance? Would we have them deserting the plough, quitting the honorable though humble occupations of their own domicils, and enter the arena of political strife, and engage in the idle struggles for precedence, notoriety, and display, which every where excite and agitate the community? Far from this. We think this would be alike injurious to their interest and comfort. We think farmers are almost always losers by every engagement or occupation disconnected with their proper pursuit, which necessarily carries them away from home. We do not mean occasional absences, in which a farmer may go abroad, to see, as Blakewell expresses it, "what his neighbors are about;" for in this way, he may get much valuable information, which otherwise he could not acquire; but we mean engagements, occupations, and absences, which necessarily divert his attention from the proper business of his farm. We have never known a farmer set up for a politician, or a jockey, either on the turf or in the market, or a man of pleasure, without his farm suffering for it. But what we desire is, that the occupation and profession of agriculture should be advanced to that degree of respectability, which should make it an object of desire instead of disdain, and give it that place in the public estimation, which its importance justly claims. We wish that manual labor should be considered honorable; and that the man who, by the sweat of his brow, develops the resources of our great nourishing mother, the earth, and, by toil and skill, extends these resources and doubles her products, for the subsistence and comfort of the animal creation, and thus multiplies indefinitely the capacity and means of happiness, should be regarded as among the truest benefactors of the community; as occupying one of the most honorable posts, and performing one of the most useful parts in the beneficent scheme of Divine Providence.

The next inquiry is, can this be done? We shall not undertake to say how fully or to what extent it may be accomplished; but we are happy in the belief that much has already been done, and still more may be effected, to render the profession of agriculture as respectable as, in a political view, it is useful, and, to a rational mind, engaging and delightful. What many of us feel to be matter of serious regret, and which results, in a considerable degree, from the false notions of which we have been speaking, is the fact that farmers' sons are in so small a proportion found willing to engage in the business of farming; but are crowding into the learned professions, already full to overflowing; pushing into every avenue of trade, with the impetuosity of apent-up stream, suddenly bursting the barriers of its inclosure; thirsting for political office or employment under any form, with an eagerness as impatient as that with which certain voracious expectants in the farm-yard gather round the trough at the call of the herdsman; forsaking the simple fare and the plain and humble occupations of the country, for the enervating, and too often pernicious luxuries and pleasures, and the exciting, harrassing, and uncertain cares, may we not add, perilous games, of city and commercial life; exchanging the wholesome and free pursuits of agriculture, oftentimes at the certain risk of health and life, for some of the most unwholesome pursuits of the arts and manufactures, if so that in any way they can see a quicker return in cash for their labor; more often seeking to live by their wits than their hands; and, at the peril of peace, honor, and all good morals, plunging into the most extravagant and hazardous speculations.

Now, to be sure, the obvious and perhaps only cure for this evil would be to correct the moral sentiments of the community; to give the young a truer standard of duty; more correct views of what is honorable; a juster sense of what they owe to society, and better notions of the true dignity and good of life. It would be well, if we could early make them feel that they were as much designed to labor as to live; that the industrious employment of their talents of every kind, is an obligation of the highest solemnity, and one which they cannot forego with impunity; that all labor which is useful, whatever may be the current estimation of it, is equally honorable; that a competency is far more favorable to comfort and to virtue, than an excess; that exemption from care and labor is, in most cases, a curse rather than a blessing; that a sufficiency of the common comforts of life, with the means of meeting the ordinary claims of hospitality and beneficence, added to the gradual improvement of our

condition, as we advance in age, presents the situation of all others the most desirable and enviable in human life; that an inordinate avarice, with its ordinary concomitants of niggardliness, fraud, and inhumanity, is among the most debasing of all passions; that they who make undue haste to be rich are seldom innocent; that sudden acquisitions are always hazardous to virtue; that speculation is a game of hazard, in which men much oftener lose than win, and extraordinary gains are but too often made at the cost, if we may use the expression, of losses, for which no pecuniary success can ever furnish a compensation. These moral influences are likely to have but a very partial operation. Few are so fortunate in the situation in which they are early placed, so favored in their connexions, their parentage, their education, their early advantages, —that these impressions become so deeply implanted in the seed-time of life, and so carefully watched over and strengthened by parental culture and example, as to control the decisions of youth, and fix their lasting impress upon the character. To most persons, indeed, these lessons come only as the fruit of their own mature experience, and so late in life that it is almost beyond our power to retrieve our early mistakes, and apply the dictates of wisdom to the regulation of our business and conduct.

But what these moral influences may fail to effect, we may hope will be ultimately accomplished by the power of education, operating in conjunction with them; we mean intellectual education,—intellectual improvement. In this matter, we trust we shall be doing no injustice to the agricultural class, if we say they are very deficient; that they are very far below the point, in the scale of information which they ought to have reached, in this age of easy knowledge and unexampled progress. Taken as a body, are not the farmers, in respect to intellectual improvement, far behind the merchants and the mechanics. With professional men, of course, we do not compare them. If farmers, then, would be respected as they ought, they must, by the improvement of their minds, establish their claims to this respect. They must not only cultivate their lands, but they must cultivate themselves. Putting moral character out of the question, for nothing is to be compared with this, what raises one man above another? Not animal strength; not political power; not mere cunning; not artificial or arbitrary rank; but mind, knowledge, intellectual cultivation, true philosophy. This constitutes the only real nobility of human nature—the legitimate aristocracy of mankind, whose laurel honors are open to all, who will deserve them, and with which no aristocracy of wealth, or power, or title, can ever come into competition.

We say, then, there is no class in the community so much interested in education as the farmers. They are the most numerous part of the population; they are in every respect the most important part of the population. We mean nothing invidious or disparaging to other pursuits or professions by these remarks, but *they* have more at stake in the country than any other class in the community. Professional men, merchants, and others, among the non-productive classes, may change their business, pursuits, or residence, at pleasure; readily become naturalized to any situation in which they happen to be placed; carry their goods, talents, and capital, with them; and soon take root wherever they chance to fall. Not so with the farmer. His farm is immovable; he is a fixture to the soil; he cannot, if he would, separate himself from his country; and all his interests are involved in its welfare and condition. Floating capital, as it is termed, may play ten thousand pranks; expose itself at one time, and suddenly hide itself at another; now rise to the surface and basking in the sunshine, making the whole sea, as far as the eye can reach, appear like a bed of glittering diamonds; and then, at the first rising of the storm, when the threatening cloud is no bigger than a man's hand, at once sink to the bottom, and bury itself in its unsearchable concealments; at one time emerging from the waters long enough only to throw its dazzling rays into the eyes of the bewildered and enraptured beholder; and then, as it were, at the pleasure of the magician, who cries begone, it vanishes from his sight. It is far different with what is properly called real property—the farm, the capital of the farmer; that remains fixed and exposed, without the possibility of withdrawal, or concealment, or shelter, to all the changes of the political sky. All that he calls his own is fastened, by an inviolable chain, for weal or for woe to the destinies of his country. Are we wrong then in saying, the agricultural class are the most important part of our population? and can we, in respect to this class, possibly overrate the importance of education? To what class in the community is it so important that they should understand their rights; that they should have a just perception of the true interests of the country; and that they should be qualified for the intelligent discharge of their duties as citizens of the Republic, who must always have the deepest interest in its destinies and fortunes; and who, so long as our free constitutions are sustained, and the right of universal suffrage is continued, must have its government and condition within their control? Nothing can effect this much for them but education. This only can secure to them that respectable standing in the political community, to which they have a just claim, and enable them to exert properly and successfully the important influence which belongs to them. While the great body of the yeomanry remain an ignorant, and comparatively degraded class, the inevitable consequence of ignorance, there is in truth no adequate security for public liberty.

Education, in the next place, is most important to the farmers as matter of interest—I mean as matter of interest and profit in their own art. I know very well the idle and senseless sneers, which are thrown out continually against what is called book-farming, but they are scarcely worth noticing. I am not unaware, likewise, of the great importance of practical knowledge and personal experience in an art so practical as agriculture. Yet I have no hesitation in saying, that there is no art, which, for its improvement and success, owes more to science than this. I admit that some of our most successful farmers, in a pecuniary point of view, as well as some of our most enterprising merchants, have been men of very imperfect advantages, and limited information. But though they have been men of few of the public and ordinary advantages of education, yet such men have never, unless in some very extraordinary and accidental case, been other than what are called self-taught men; men of great natural shrewdness and intelligence, who have anxiously availed themselves of all the advantages within their reach, and obtained all the information in respect to their particular profession and art, which it was in their power to acquire. And have they not themselves invariably felt and lamented the want of education? And would not their labors have been more efficient, their improvements greater, their efforts made with superior success, if, to the native energy, and perseverance, and good judgment and skill, for which they have been remarkable, had been added the knowledge and information, which superior early advantages of education would have afforded them? But produce as many of these cases of extraordinary success on the part of uneducated men as can be found, and, on the other hand, of the ill success of merely theoretical men, literally book-farmers, who, without any previous practical knowledge, have undertaken to manage and cultivate a farm solely by information gathered from treatises of agriculture, (and yet I confess I have never known such instances,) yet if these cases of either kind were a thousand times as numerous as they are, would this overthrow the established principle of the universal value of knowledge; and if, in every other art, even the most humble, knowledge is so important, is the source of power, and an essential means of success in the great art of agriculture, involving so many relations to be regarded, so many operations to be performed, so many materials to operate upon, and so many instruments with which to operate, can we be guilty of the flagrant absurdity of supposing that here science is of no avail; much rather, is it not as obvious to any reasonable mind, as the light of the sun to any clear eye, that knowledge must be valuable and important every where, just in proportion to

the greatness of the art to which it is to be applied, and the many subjects of action or use which that art involves?

What, however, is practical skill itself but the avails of knowledge? When a man does a thing well, even in the most humble mechanical art, we say he *knows* how to do it. Careful inquiry and observation, added to repeated trials, have taught him the best mode of operation. Now, may not others avail themselves of what he has learned, and save the expense of time and trouble necessary in repeating the experiments which he has made, and going over again and again the same ground which he has traversed? Is not the great part of all knowledge, especially that of a practical nature, the fruit or result of experiment; and wherever and however this knowledge has been obtained, ought we not gladly to use it; and does not even the most practical man, if he has any pretensions to common sense, carefully and necessarily avail himself, in every department of business, of this knowledge, which has been the acquisition and accumulation of centuries? May not this knowledge, then, be communicated in, and gathered from, a printed paper, a book, as well as in any other form; indeed in this form rather than any other, with many obvious advantages?

If, then, knowledge is not only valuable, but indispensable in the most simple operations of practical husbandry, it is still more necessary in all its higher departments. The nature of soils, the nature and properties of manures, the varieties of plants, their seasons, cultivation and uses, the raising of animals and the improvement of their breeds, the construction of even the mould-board of a plough, are all matters of science and philosophy; which come to the man by intuition; which are to be learnt; for the improved condition of which, we are indebted to the experiments and studies of intelligent and sagacious minds, who have given days and years to the examination and trial of them; for which even the most common farmer, who opens a furrow, is greatly in their debt. To deny the obligation, is most ungrateful; to wrap ourselves in the conceit of our own perfected wisdom, and to refuse to avail ourselves of the result of other inquiries and experiments on subjects, where we can only be said as yet to have reached the shores of the great ocean of truth, would be consummate folly.

We say that agriculture is most largely indebted to science. All the great improvements which have been made in theart, are due to science. Intelligent men, learned men, sagacious, inquisitive, scientific, experimenting men, the bright light of society, who are always in advance of their age, are the men who have led the way in agriculture, as well as in every other improvement in society. They have brought the power of mind to bear on this great subject; and wherever its rays have been concentrated, they have kindled a flame which has served to cheer and to guide the humble laborer, otherwise groping in darkness, to treasures buried in the earth, which, without it, he never could have reached, and whose existence, otherwise, he never would have suspected. Science, within a century, has more than quadrupled the products of the earth; has immeasurably abridged the toil of the husbandman; and has made the labor, which he does bestow, ineffably more efficient than, without its aid would have been rendered. To science we owe the improved form of the plough, which will do twice the work, with half the power, which could have been executed by the clumsy implement of not many years since. To science we owe the cultivator, the roller, the threshing mill, the cotton gin, the sugar press, the flour mill, the spinning jennie; and but for science, but for what is contemptuously termed book-knowledge, we must now have been satisfied with wearing the skins of our flocks, unshorn of their wool; and have been left to the miserable necessity of planting our corn with a stick or a clamshell; and grinding it in a hallow stone, with an Indian pestle.

What science has yet in store for agriculture, no sagacity can foresee. If we may judge from what it has done, we may look forward to most extensive and more valuable improvements. Education is most important and useful to the farmer, in enabling him to avail himself of what has already been achieved; and in qualifying him for, and stimulating him to, new advances. In the art and science of agriculture, let men speak of it with what disdain their ignorance or self-conceit may prompt, there is room and occasion for the exercise of the highest intellectual abilities; here, as in every other case, knowledge is power; and knowledge constitutes a productive capital; and here, other circumstances being equal, knowledge will not fail to give all the advantage over ignorance, which it confers in any other department of business or of life.

We urge the importance of education upon the farmer, as among his greatest and most valuable resources of comfort and enjoyment. The farmer, even in the most busy situation, but especially remote from the city, has abundant leisure for reading and intellectual improvement. There are many stormy days when his out-door labors are remitted; there are his Sundays, which, with the exception of the hours devoted to public worship, are usually uninterrupted; there are the long and still evenings of winter, which, without some intellectual resources, are most likely to be spent in stupid drowsiness, or, too often, in a manner far worse, at the shop or the tavern. What favored seasons are these for the delightful companionship of books! what inexhaustible sources of innocent and refined pleasure are here opened to a man's self! and what abundant opportunities for communicating instruction and pleasure to one's family! and, with respect to the young especially, hanging upon us with all the confidence of affection and reverence, of laying a foundation and adopting the best means for their improvement! "Studies," says Bacon, "serve for delight, for ornament, and for use." Cicero passes a still higher encomium upon them, in his beautiful oration for Archias. "Studies give strength in youth, and joy in old age. They adorn prosperity, and are the support and consolation of adversity. At home they are delightful to us; they present no impediment to business; they pass the night with us; they are the companions of our journies; and they give a charm to our rural retirements." Education immensely enlarges the capacity and disposition to receive pleasure from natural phenomena, objects, and scenery. The scientific classification of the clouds makes them objects of new interest. The knowledge of the names and places of the stars introduces us to a kind of living and almost speaking familiarity and companionship with them, which enlivens the solitude of the stillest evening, and the most retired walk; and fills the mind with noble, elevated, and irrepressible aspirations. Botany, chemistry, mineralogy, multiply, indefinitely, our sources of pleasure, and give an interest and value to objects, which we might otherwise trample upon without notice, or pass by with utter indifference. Natural philosophy, natural history, in all their branches, people every part of the physical world, to which we can have access, with objects of delightful and absorbing interest; and to the inquisitive and enlightened mind, unlock treasures infinitely better than golden treasures, which are hermetically sealed to the incurious and ignorant. Before the farmer, the privileged resident in the country, the book of natural theology spreads its instructive, ample, and brilliant page. The most ignorant can scarcely remain always unmoved by it; but study and science are necessary to read it with advantage and effect. The enlightened mind only can interpret, with a force and eloquence true to the original, its mystic characters, and penetrate the depths of its fountains of wisdom;—the enlightened mind only can see, in the greatness, grandeur, and glory of the works of nature, its overpowering demonstrations of design and skill; its wonderful exhibitions of creative power and wisdom; its exuberant, unbounded, and inexhaustible pourings out of beneficence and love.

But I must stop. I fear I have already drawn too largely on the indulgence of my readers. I have thrown out these very general notions of the importance of science and education to farmers, as preparatory to some more detailed and practical views, which, at a future and convenient season, I may take occasion to lay before the readers of the New-York Farmer. There is, I

repeat it, as it seems to me, no class in the community to whom education, scientific and literary education, is more important than to the farmers. There is no business-pursuit or profession, exclusive of the learned professions, whose situation is, in most respects, more favorable to it; and there is none, which it would more benefit and adorn. Could more educated men be induced to enter the profession; or rather, could there be all necessary and suitable provision made for educating those, who are disposed to make agriculture the business of life, incalculable benefits would result from it to the community. It would place the profession, in the public estimation, where it belongs, as among the most innocent, useful, honorable, and happy in which men can engage; it would qualify the agricultural class, whose character and influence so essentially concern the honor and welfare of the country, for the right performance of their high duties; it would serve vastly to extend the agricultural resources and multiply the products of the country, and thus immeasurably increase its wealth and power; it would diffuse, in unimaginable amount, the means and resources of domestic comfort and enjoyment; and, as in every other case of the advancement of the spiritual and intellectual over the animal and sensual nature, it would spread a salutary moral influence through all the circulations, and to the utmost limits of the social body. H. C.

Meadowbanks, Nov., 1835.

Notices of the Season; and Hints on the Care of Live Stock. By H. C. [For the New-York Farmer, and American Gardener's Magazine.]

The season of agricultural labor has now closed; and the farmer has every reason for gratitude to a benignant Providence, which has signally smiled upon his labors. If not an excess, there is an abundance of the products of the earth. If some crops have either failed or proved scanty, others have been luxuriant and ample. Indian corn, wheat, and hay, must generally be considered as short crops. The produce of the Dairy is less than its usual amount; but oats, rye, potatoes, and esculent vegetables of every description, have been extraordinarily fine and plenty. The general health of the season has been almost unexampled, both in city and country; and the voice of gladness has been echoed and re-echoed from every part of the land.

The month of October, and, with very slight exceptions, the month of November, thus far, (20th) have been only a succession of dry, mild, and sunny days. The mercury, late in October, in this part of the country (Valley of the Connecticut) has repeatedly stood at 76 deg., sometimes at 80 deg. Fahrenheit; and the grass in many places in this vicinity, both in pastures and meadows, has the freshness of May. This weather has been particularly favorable to the ripening of the Indian corn, and to the easy execution of the usual fall work. Such a pleasant autumn, such uninterruptedly fair, mild, and literally beautiful weather, is not within the memory of our oldest inhabitants.

December, however, will soon be upon us; and 'winter,' says the homely adage, 'never rots in the sky.' The products of the earth, being now gathered and stored, the inquiry and duty of the farmer now are, how to apply them. Of those products which are eatable, and of course perishable, the farmer has only two ways to dispose of them: to consume them with his own stock, or to sell them for the consumption of others. The latter operation is likely to give him the most money, where he lives near to a ready market; the former will not unfrequently in the end give him the most profit. The latter may be, for the present, better for his pocket; the former better for his farm. In many cases, however, there is no alternative; and the remoteness from market compels the farmer to convert his bulky produce into a portable form.

For this operation I shall undertake no more than to suggest a few general hints, which most farmers probably understand already better than I can tell them; but which it may not be wholly without advantage to recall to their notice.

The first inquiry to which an intelligent farmer will give his attention, is to what species of stock may his produce be most advantageously appli d; whether to the raising of neat cattle, horses, or sheep; whether to the feeding of store stock, as they are termed; or to the fattening of cattle for the market; whether it shall be converted into dairy produce, or wool, or beef, or pork, or mutton. The determination of this important question depends on so many local and accidental circumstances, the nature of the produce, the absolute or current value of the produce, the proximity to a market, the condition of the supply and the demand, that no general direction can be given, which would be universally applicable. Every careful farmer will make this subject matter of serious and repeated consideration and experiment. Does he propose a winter dairy? What amount of butter is a good and well fed cow likely to yield? What will her feeding require? How much will she consume? and what is likely to be the value of her produce, when it has passed through the whole process of being converted into cash? Does he propose to keep sheep for their wool? What is to be the probable cost of their keeping? And what amount in quantity and value of wool, and of stock, are they likely to return to him? Does he design to fatten beef? Will he fatten steers or oxen, heifers or cows? What amount of hay, or of grain, or of potatoes or turnips are they likely to require? What is the value of the produce necessaay to their thrift; the expense of its preparation; the mode of its application; and what may they be expected to gain in weight per day, and to bring in the market when sold? These and many other queries suggest themselves on this subject. In respect to most of them the great majority of farmers, whose highest ambition seems to be, as they express it, merely to get along, make no inquiry, have instituted no experiments; and can scarcely give you a conjectural, much less a definite, and certain answer. But it is obvious that no farmer is entitled to the reputation either of prudence or intelligence in his profession, who has not made these points matter of careful and exact inquiry and experiment.

But, to whatever kind of live stock the farmer chooses to devote his produce, some rules are of universal and indispensable importance. Whether store or fatting stock, the first requisite is attention. If he would have his animals in healthy and thrifty condition, they must be attended to. The eye of the master is here particularly important. It will not answer at one time to give them none or only half an allowance; and at another time to fill them to repletion. The successful feeding of animals demands the greatest care. Regularity as to time is of great importance. They have very little of the philosophy of patience, though they are often compelled of exercise much of that of endurance. When the stated time returns, of which there is no difficulty in discovering, that their appetite keeps accurate measurement, their meals should be ready for them; and there should be a careful attendant at the table, to give them their feed in such quantities that they will consume it, while it is fresh; and not have so much left before them at a time, that it is rendered offensive by being blown upon; and they turn from it with disgust, and will not again touch it but by compulsion. During the hours of feeding a little at a time until the appetite is satisfied; and then if any remains, the rots and fragments carefully taken from the crib, and given to those animals, who are expected to live only upon the second course, is a necessary rule both for the thrift of the animal and the economy of the food.

The preparation of the food is next to be considered. Experiments conducted with great intelligence and exactness by Scotch farmers, under the particular cognizance of the Highland Agricultural Society, proves that the cooking of food for fattening neat cattle does not yield advantages over food given in a raw state, sufficient to compensate the extra trouble and expense; for swine, however, it is eminently useful; and the steaming of potatoes for horses has been found by Curwen and others, matter of great economy, and singularly conducive to their vigor and health. The preparation of all long food, by cutting, is extremely advantageous to the health and comfort of the animal, and to the pocket of the owner. It is a well established fact, that by cutting long feed from a quarter to a third of the expense of keep may be saved. On this matter I design, on a future occasion, to enter into very full details, from ample materials, which I have on hand.

Cleanliness is another important point in the care of domestic animals. Even the proverbially dirtiest of all animals, the hog, is found to thrive far better, when kept in a clean and well-littered stye, than when left to wallow and repose in his own filth. But cleanliness is particularly beneficial to neat cattle, horses, and sheep; they will not thrive well, they will lose their appetite, when this is not attended to. They

require to be well littered, to be well curried, and especially to have wholesome and fresh water, and sweet and clean mangers. Sheep are particularly fastidious in these matters; and to the thrift of any animal it is quite necessary that their appetite should be kept good.

We urge, in the last place, upon farmers, in the treatment of their live stock, the most persevering and exemplary kindness. Kindness is as much matter of interest as of duty; always, with all animals, it does good, like a medicine; and the brute creation, though in a less refined degree, are almost as sensible to it as the human. It is said of the celebrated Bakewell, that he was not unfrequently employed to subdue the most violent and refractory horses; and that his great and successful method was inflexible and persevering gentleness and kindness. It used to be a very significant injunction of a farmer, whom I well knew, to his hired men, 'strike *me* when you please, but never strike my *cattle*.' All cattle suffer very much from abuse and cruelty. Sheep are excessively timid; and one of the most important rules in the stall-feeding of sheep, is, to keep them as quiet as possible, and never, if possible, permit them to be alarmed.

I shall add no more to these imperfect hints at present. Attention, punctuality, regularity, exactness, cleanliness, and kindness, are earnestly urged upon the farmer, as rules of the first importance, and in which his interest as well as common humanity are greatly concerned. It is most delightful as well as honorable to see a benevolent farmer go among his brute family like a kind parent among his children and dependants,—caring for all their wants, and anxiously providing for their comfort and protection from hunger and cold, and abuse and cruelty. They know him; they love him; they fawn upon him; they welcome him. Instead of a kick for this one, and a blow for that one, and a curse for another, which makes them all tremble when they hear his approach, he is recognized by them all, as a friend and a benefactor. He has an apple for his old servant, the horse; a nubbin of corn for the patient and enduring laborer, the ox; a handfull of salt for the gentle sheep, who crowd around him to lick his hand; and even the rude hog will stand still to be patted and scratched by him, and acknowledge the kindness as well as he knows how. This is a beautiful picture of true humanity, decked out with no dazzling colors, and set in a very humble frame; but in which it will not be difficult to discover much true wisdom, and not a little of the spirit of Christianity. Cruelty to animals is an odious vice. Kindness is an equal virtue. Are they not all God's creatures as much as man himself? Has he given to man dominion over them? and is not this power held under a solemn responsibility? Are they cast by the Divine Providence upon man's care; will he abuse this trust? Do they minister to his luxury, to his pleasure, to his subsistence? Where are the claims of gratitude? I conclude with the petition of the horse to his master:

"Up hill urge me not;
Down hill crowd me not;
On the plain spare me not;
In the stable forget me not."

H. C.

Meadowbanks, Nov., 1835.

TEASLES.—A farmer in Williamsburg, Mass., it is said, sold his crop of teasles this year, to a manufacturer, for one thousand dollars. The purchaser told him he would not add another thousand to have his whole farm into the bargain. The farm is an ordinary one; but this is a very extraordinary case. It may not be done again in a century. "One swallow does not make a summer." The demand is very limited, and they had become scarce. A few acres of ground would, under good cultivation, produce enough for all the manfactories in the country; and the market would soon be glutted. It requires two years to mature a crop. This story will be enough to keep half the Yankee farmers and all the tin pedlars awake for a week. Some of the shrewdest of them in Connecticut will very likely try their hand at whittling them out of cucumbers, to go with their lignum vitæ nutmegs.

SAXONY SHEEP.—We promised, in the October number, to obtain, if we could, and publish an article, signed "R," which appeared in the Cultivator of May. We did obtain it, and put it, with other copy, into the hands of the printer for the November number, but by some accident it was mislaid, and did not appear, as we intended it should, accompanied by R.'s second letter. The omission was altogether accidental.—If it should again come to hand, or if R. will furnish us a copy, it will certainly be published.

We give the annexed communication with pleasure, coming, as it does, from a practical and intelligent farmer.

Saxony Sheep.—By FARMER C——. [For the New-York Farmer, and American Gardener's Magazine.]

Mr. Editor,—Having heard much of the celebrated flock of Saxony sheep, of the pure *Electoral breed*, kept by Mr. Henry D. Grove, of Hoosack, Rensselaer county, and wishing to improve my present stock of sheep, I resolved to pay that gentleman a visit. I accordingly availed myself of a leisure time, and set out with a determination to purchase a few, and gather information from his experience. Accordingly, after a speedy passage of two and a half days, I found myself an entire stranger at the house of Mr. Grove. I was, however, received with the kindness and welcome I might have expected from an old acquaintance; after an hour or more of chat, we took a ramble over his farm, which I found in excellent order, although upon which perhaps considerable improvements might be made, as he informed me there had already been made, and were still making. He showed me his small stock of excellent short horn cattle, all in high condition, and with which I was well pleased. We next proceeded to a field where were his buck lambs, about 30 in number; we yarded and examined these thoroughly, as we did also his ewe lambs in an adjoining field; we next yarded his older bucks, and took a searching look at them. His whole flock of about 150 ewes were yarded, and I had an excellent opportunity of examining them singly, and found them to be much superior to what I had anticipated. Having taken plenty of time and exercised my utmost carefulness and attention in the examination of Mr. Grove's flock, I think I can say, and that too without arrogance or duplicity, it is decidedly the best flock within the circle of my acquaintance, especially his ewes, his buck lambs, and reserve service bucks. And, further, I would most candidly recommend to those wishing to improve their flocks, to visit Mr. Grove, and examine his flock for themselves; I feel fully assured none such would return to their homes without at least one of his full blood Electoral Saxons. I left home not expecting to purchase more than two or three, but finding them so excellent, could not leave without taking eleven, 4 grown bucks, 3 buck lambs, and 4 ewes, which cost from $15 to $20 per head at Mr. Grove's; cost to transport by waggon to West Troy, $3 50, from thence to Manlius, on boat, $5 50, toll, 78cts., cost of keeping up, $3 50.

Since my arrival at home I have been persuaded by some particular friends to let them have one a piece, three of them two grown bucks and one buck lamb at $25 per head, and so well are my neighbors generally pleased with these sheep, that I presume I could sell the remaining ones at a much higher rate. I very much approve of Mr. Grove's winter management of sheep, which it may not be amiss to notice in this place; he has a large barn built on a side hill descending to the east; the upper part of the building is for keeping the hay, and the basement serves as a shed, or stable, for it may be closed by doors, or they may remain open, at pleasure. At one end is a large, warm, and commodious cellar, where potatoes, turnips, &c. are kept for winter feeding; these are cut in a trough containing 3 or 4 bushels, with an instrument not unlike two spades, the edges crossing each other at right angles, and fitted to a handle about 4 feet long, with which a man will cut 2 or 3 bushels per minute. His racks are light, convenient, and simple, consisting of three small poles, the one at bottom receiving the rounds of each side and one pole on each side at top, the rounds two feet long and ¾ of an inch in diameter, and the top poles separate about two feet, then a light manger about two feet wide and one foot from the ground, the rack is set firm lengthwise in the centre of the manger, which catches all that falls from either side of the rack, and is an excellent plan to feed grain, potatoes, &c. It is the opinion of Mr. Grove, (and I count him good authority,) that potatoes are preferable to turnips for sheep, because they are a much more substantial food, and will never cause sheep to scour if they are regularly salted and otherwise properly fed. He also considers it highly necessary that sheep should be regularly bedded with straw; his racks and manger, where his sheep are fed are kept constantly under cover. Mr. Grove keeps a regular record of births, deaths,

sales, and every circumstance relative to his flock is there exactly recorded, every sheep is numbered by marking the ear, and the number is strictly recorded, and many peculiarities highly interesting I might state; but I will conclude by advising my brother farmers to go and *see* Mr. Grove, and *hear* from his lips, and *learn* by his experience, many things for their welfare. FARMER C——.

Manlius, 27th Oct., 1835.

The following communication is from a New-Jersey farmer, who will please accept our thanks for his favors, and repeat them frequently—and to others we would say, they will oblige us by doing likewise,—we hope they will furnish the information desired.

To the Editor of the New-York Farmer:

As winter evenings seem to afford a suitable opportunity for intellectual improvement, and considering that the pages of a periodical of this kind are dependant very much on correspondents for matters of information, and that it is the part of every subscriber to contribute his mite to the improvement and information of the readers of an agricultural work of this nature, I have ventured to pen a few of my thoughts.

The farmers of almost every section of country differ materially in their modes of farming, and opinions respecting the most profitable manner of converting the produce of their farms into money. Their difference of opinion is certainly allowable and natural when we take into consideration the difference of soils, the distance from markets, the difficulty in most neighborhoods of obtaining proper help, &c., all of which, the farmer has to accommodate himself to in the best manner he can. The business of a farmer is in my opinion an independent, an honorable, and, when properly pursued, a profitable one; and no doubt, so long as our country continues in prosperity, the increasing demand for produce will insure to the farmer a handsome remuneration for the products of his soil.

Ploughing in of green crops, as practised in the State of New-York, is so economical a mode of enriching the soil, that I have often marvelled it is not practised to a much greater extent in other places. Allow me to recommend the spreading of a coat of lime previous to ploughing in.

If the slovenly farmer who allows his weeds to grow up unmolested and cover his fields, would, instead of this, plough them under, after a few repetitions of this, he would be surprised at the increased fertility of the soil, and save the labor of carting manure from a distance.

With respect to the best crops for turning under, there are various opinions; rye and red clover are perhaps as much in use as any others, though some plough in oats, millet, turnips, &c. In dry situations this practice succeeds best, as by the ground remaining exposed to wet the crop turned under would not be so likely to rot. With regard to turnips for ploughing in, I must acknowledge myself an unbeliever; I have heard of its being done to profit by others, but have seen it tried in my own neighborhood without success. Perhaps, however, it is owing to some difference in cultivation or soil with which we are unacquainted. It would confer a favor on us Jersey men if some of your successful New-York farmers would furnish us with their experience on the subject of ploughing under green crops for manure, and on other modes of economising that very expensive yet indispensable material in the business of agriculture. JUNIUS.

NEW-YORK FARMER.

DECEMBER 1, 1835.

Another year has passed. With this number the volume for 1835 is closed. I may, therefore, I trust, without being considered intrusive, ask the attention of its readers and patrons, for a moment, to the NEW-YORK FARMER. When the work came into the hands of the present proprietor, it had nearly completed its 5th volume. It was then in a depressed condition; and by some it was doubted whether it would survive a *sixth* volume. In October, 1832, it was offered, with its books, and accounts, to me, at what I then deemed a *bargain*; but, like many *other* bargains in this life, it proved an exceedingly hard and vexatious one—as at least *one third* of the names on its list, when it came into my hands, were struck off at, or soon after, the close of that volume; while many of those who continued to receive it, delayed paying not only for the volume in advance, but also the accounts which were transferred with the work.

In consequence of this delay, and the enlargement of the work, the expense of publication, during the 1st and 2d volumes of the *New Series*, materially exceeded its income, which prevented me from devoting as much expense to its Editorial department, as I desired. I have, however, endeavored, with the aid of its friends, to render the work, at least useful to practical men; and if it has not been as much so as its readers had a right to expect, they must attribute it rather to its limited circulation, which does not enable me to secure as great a number of able writers, (in addition to those who, with liberal and ready hands, work for the benefit of the great cause of agriculture, without charge, or compensation, and who are entitled to, and will please accept of, my best thanks,) as I could desire, and they will, therefore, I hope, every man of them, endeavor to induce *two*, at least, of his neighbors to subscribe for the "NEW-YORK FARMER," and to pay for it *in advance*—which will soon place the balance on the other side of the Ledger, and enable me to effect what has been, and *still* is, my aim, to make the New-York Farmer *equal*, at least, to any other work, devoted to the same subject, in the country.

If it has wanted, during the last 8 months of the current, or just closed volume, its usual variety, and method, in consequence of the absence of its former worthy Editor, Mr. FLEET, it has, during the same period, exhibited in its pages, the productions of other able and sound writers, to whom I am much indebted for their liberality for the past; and here take the liberty to solicit a continuance of their aid during the ensuing volumes, as I am resolved still to continue the work in aid of the cause, to which we owe the present almost unparalleled prosperity of the country—AGRICULTURE; and to secure such aid, to render it valuable, as the income of the work will allow. In order, however, to do justice to the subject, and to its readers, it is essential that all arrearages for the work should be promptly paid—and also that the terms of the work, "*Payment in advance*," should be complied with hereafter.

I am perfectly aware that to many, *three dollars* appears a small amount; and that they think it of little consequence whether it is paid at *one* time or an *other*; and so perhaps it might be, if there was but *one* or *two* such dues; but when it is borne in mind that the whole business and *income* of the Farmer is in precisely such bills, and at the same time scattered over the *twenty-four States of the Union*, it will be at once perceived that the only possible mode of carrying on the business successfully, is by receiving payment *in advance*. It is, therefore, respectfully requested that those who are desirous to continue the New-York Farmer, and to aid in its prosperity, will remit by mail the amount of the ensuing year's subscription in advance.

Those subscribers who reside in States where there are no bank notes less than *five dollars*, will please remit that amount by mail, and it shall be placed to their credit.

Renewed efforts will be made to render the work still more worthy of the attention of the public.

D. K. MINOR, Proprietor.

New-York, December 1, 1835.

THE ALBANY FAIR, held at the city of Albany, on the 13th and 14th of October, would have been given in the November number of the New-York Farmer, but owing to the immediate succession of the Fair at New-York, the several committees could not meet in season to make out the report.

With respect to the department of Farm Stock, the exhibition might be considered almost a failure, falling much short of former years. A few valuable animals, however, were exhibited; and it is much to be hoped our spirited farmers in the vicinity will not suffer such a falling off to continue another year.

The display of manufactured articles was very respectable, exhibiting a good degree of enterprise, taste, and ingenuity. But the most interesting department

was that of labor-saving inventions, particularly in the department of farming implements.

In Horticulture, also, the articles presented did much credit to the industry and science of the contributors. The trophy, exhibited by Mr. Walsh, was worthy of more than a passing notice. It must have spoken in cheering language to the heart of every one who saw it, who has any relish for that interesting branch of science and art.

It was a kind of obelisk, about 8 feet high, and supported in the back of the centre by an upright plank, raised from a platform, but which were concealed from view. On this were displayed, with playful, but tasteful, ingenuity, all the implements of Horticulture, disposed in such order as to have the appearance of a structure composed entirely of those articles, which was, in a great measure, the case. All these implements were enwreathed and decorated with the most appropriate flowers. And, to show that the sister arts were not forgotten, in the centre, as the insignia of manufactures and agriculture, were a group consisting of teazles, cocoons, and skinless oats; and, in their proper places, the representation of those things which make the heart glad—corn, wine and oil. Should we be able to obtain a drawing, we may, perhaps, present our readers with an engraving, in a future number.

We take the following acknowledgment from the N. E. Farmer. It is an evidence that the Society is in earnest, and also, that the members understand the mode of encouraging domestic industry. We should be much pleased to record a similar instance of liberality.

LIBERALITY.—We are happy again to acknowledge our obligations to *The Rhode Island Society for the Encouragement of Domestic Industry*, for their very generous appropriation of one hundred and fifty dollars to purchase copies of the New-England Farmer for the use of said Society. We should be extremely thankful if other similar Societies would exhibit a similar spirit of generosity; and we would endeavor, by increased exertions, to promote the great objects for which they are associated, and to which their efforts are so beneficially directed, to merit such munificence as has repeatedly been manifested to us by the above-named Institution.

[From the American Gardener's Magazine.]

The Influence of Flowers. By C. C.

"Are not flowers the stars of earth, and are not stars the flowers of Heaven? Flowers are the teachers of gentle thoughts, the promoters of kindly emotions."

Among the many indications of the advance of our country in taste and refinement, none afford a surer criterion than the increased attention which is given to flowers and fruit. When we notice the many establishments in our vicinity, within a few years, devoted to the improvement of horticulture, we cannot but rejoice at the diffusion of an employment so well adapted to afford much pure and innocent pleasure; and we doubt not the time will soon arrive when the cultivation of flowers will be pursued as a means of moral and intellectual advancement, as well as a source of exquisite gratification.

Every thing which tends to increase domestic enjoyment, which furnishes to a family that pleasure at home, which otherwise they would be impelled to seek elsewhere, is valuable. There is nothing which adds more to happiness, than for all the members of a family to be united in one common and pleasant pursuit—not that all should have the same daily occupation—but that there should be some sources of pleasure open to all, and to increase which, all should in their turn contribute. No employment, perhaps, can so effectually give this union of purpose, and this sympathy of feeling, as the cultivation of flowers. It opens a wide prospect of enjoyment, with scenes to suit many varying tastes. To the scientific mind, to one who loves to search out causes and effects, to discover the hidden properties and qualities of things, what an interesting and yet almost untrodden field does botany present! Then to one whose heart predominates over the intellect; who delights in sentiment; who prefers deep feeling to lofty thought, a garden yields many exquisite delights. His poetic mind gathers much of its finest imagery, its most beautiful thoughts, from the fragrance and loveliness of flowers, and it is quickened and enlightened by the thoughtful contemplation of their varied graces.

And for humbler purposes, for less exalted natures, the riches of Flora furnish many gratifications. For the morning drawing-room, or for the evening dress, there can be no prettier or more appropriate ornaments than can be found among her stores. And to the affectionate heart, what sweeter tribute can be offered to the invalid mother, or the declining sister, than the first-fruits of the garden, and the first buds of the rose. Even the little child laughs, in the fulness of its happiness, when it is permitted to play with the flowers, and fill its lap with the butter cups and clover blossoms.

And so it is in this one amusement; all ages and all tempers can find an appropriate gratification; all may be made more happy. It ministers, also, to man's moral nature. A green-house, connected, as we sometimes see them, with the most frequented apartments of a family, is, in winter, when the garden is bereft of its beauty, and the orchard has yielded its fruit, an almost unfailing source of interest. To enjoy, when storms are beating without, and the chill of winter speaks in the howling wind, the mild air, the fragrance, and the beauty of this reserved fragment of summer, tends to produce feelings of contentment and satisfaction—feelings which show themselves forth in acts of kindness and words of affection.

Another advantage which the cultivation of flowers affords over other pleasures is, that it can hardly be wrested to evil. Absorbing as it is, it produces no feverish excitement. Bringing the mind into close contact with the loveliest things in nature, it shuts out the vexatious feelings arising from collision with the world. Its pleasures are all calm and tranquil. The contemplation of any of the works of God has a mighty effect in soothing and quieting the tumult of human passions, and this precious power over the heart is freely given, even to the lilies of the field. Where we see a love for these, that is not the place to look for the turbulence of [illegible]

by the road-side a cottage, around wh[ich] door the sweet-briar and the honey-suc[kle] are climbing, and before which, in its l[ittle] garden, is displayed even the humbler fl[ow]ers,—the marygold, the pansy, the a[ster] and the poppy—how instinctively do [we] form a favorable opinion of the inhabit[ants] of that cottage; how certain we may b[e] finding peace, contentment, and affect[ion] inmates here! C. C.

October, 1835.

[From the same.]

On the Cultivation of the Tulip. By J. [illegible] Russell, Superintendent of Mount A[uburn], Cambridge.

The season for planting bulbs being [at] hand, and presuming that some remar[ks] would not at this time be unappropria[te] particularly in regard to the flowering of t[he] tulip, I with pleasure send you the follo[w]ing, which will be, perhaps, of some inte[r]est to your readers, and extend the cultiv[a]tion of this favorite flower.

To attempt to describe this lovely genu[s] would, I humbly conceive, be an insult [to] the common sense of any community. Th[e] beauty of the tulip flower draws the atte[n]tion of the most careless observers, and, [as] it were, makes itself known to them [at] once, because it is one of those kind [of] flowers, when taken notice of, is rarely [or] ever forgotten. The Dutch are famed through the civilized world, for their splen[did] collections; inasmuch as some of thei[r] private ones have been valued at som[e] thousands of pounds sterling. In England I have had the care of tulip bulbs, tha[t] were valued from *five shillings* to *five pound sterling*, a *single bulb*; this is, perhaps one reason why we so seldom meet with a choice collection in this country; the firs[t] cost being so great, and the time it necessarily takes, to give them proper attention, is another considerable item with those who have business to attend to, and who have but a small portion of time to spare, in the care and production of elegant flowers. Nevertheless, there are persons in every city who can afford to spend both time and money in such pursuits; but by not understanding the nature of them, are prevented from making the attempt. In order to do away with this difficulty in part, I will engage to give them all the knowledge I have on this subject, which will cost but a trifling sum, compared to the years of time I have been collecting it together.

Those persons who are desirous of obtaining a good collection of tulips, should, by all means, make their selection from some of the established seedsmen or nurserymen; for, to trust to the bulbs that are sold every year, at the *auction* rooms, in nine cases out of twelve, they would be deceived; therefore it is highly recommendable, to make the selection from persons of established *credit*, even if the cost is four times as much, rather than to run any hazard. Supposing the bulbs are on hand, the first step is to prepare for planting: the compost should be a mellow light earth, or leaf soil, (the top spit of an old pasture field), preferring it rather light, than of a strong binding nature, and well rotted stable manure, blending the whole well together. To three wheelbarrow loads of the soil, add one of manure, and so continue on, until there is enough mixed for use. This will be found an excellent compost for the growth of the [illegible]

less, in length; preference should be given to a plat of ground that is well sheltered from the north-west and easterly winds, observing to keep away from the shade of large trees as much as possible. Having decided upon the location, go to work, and throw out the whole of the surface and under soil, to the depth of two and a half feet, taking it away to some convenient place, leaving the bottom of the bed nice and level; then look out for some good stable manure, about half rotted, for the purpose of laying at the bottom, about six inches thick; this will leave two feet in depth for the compost; this may appear, to some people, altogether superfluous; nevertheless, it ought to be done, for this reason; the manure will be in an excellent condition for mixing with the soil the succeeding year. I shall here observe, that it is not necessary to prepare a fresh compost every year, after such an one has been made as here recommended. If the operator thinks the soil ought to be renewed in some degree the second season, a portion could be taken away from the bed, and replaced with some fresh compost, and so on year after year, never neglecting to place the manure at the *bottom* of the bed, as before stated: to do this properly, begin at one end, and take out the whole of the soil, until you come to the bottom of the bed. If it was made four feet in width, take four feet in length; this will leave a trench four feet square, and two and a half feet deep; wheel the soil thrown out, to the other end of the bed, in order to finish off with. The manure should now be laid at the bottom at the depth proposed; mark off again four feet in length, and place the top spit immediately on the manure, continuing so to do, until you have a similar trench at the other end: this will completely change the compost every year, by bringing the under soil to the surface, which is of great importance—level off with the soil which was wheeled to the opposite end of the bed from where the trenching was begun.

But to return to the planting of the bulbs the first year. I shall suppose the bed or beds are already filled up with the compost a little above the level of the ground; allowing it to settle to the original level: this ought to be done the first week in November; the second week, have the surface of the bed raked perfectly smooth and even; then stretch a line tight and straight the whole length of the bed six inches from the front side, and with a small piece of stick mark off close to the line; remove the line again six inches, and mark off, and so go on, until you have six straight lines the length of the bed; this will leave six inches clear, both at the front and back; then mark off across the bed, six inches apart; this will leave the whole of the bed in six inch squares. At the angle of each square, or where the lines are crossed, place a handful of sand. If the day is fine, go to work and plant the bulbs immediately, for there is no trusting to the weather, at this season of the year. Place a bulb in the *centre* of each handful of sand that was put there for this purpose. When the bed is planted, cover them with a compost similar to that they are to grow in, three inches deep; observe to mulch the beds over with leaves or litter, about six or eight inches, before the approach of severe frosts; it is also indispensably necessary to have a light frame built over the bed, for the purpose of fixing upon it a light canvass, or strong cotton cloth, to shade the flowers [illegible] early spring of the year, some tulip growers make use of hoops bent over the beds at regular distances, and throw over bass mats; but a permanent *frame* would be but a trifling expense, and is much to be preferred. As to the size of the frame, every one can suit their own taste in the dimensions of it; all that is necessary is, to secure the plants and flowers from the before mentioned casualties. Take off the covering of leaves, &c., in the spring, as soon as the plants begin to make their appearance, and with a trowel or small fork, stir up the soil a little between each row, and leave the whole smooth and neat; now begin to make a quantity of small neat stakes, about two and a half feet in length, for securing the flower stems to, beginning at one end of the bed, and placing a stake in the centre of the four first plants. Procure some lead wire, and twisting it once or twice round the stake, you will find that there is only three inches to go to reach the flower stems of four tulips; twist it once round the stem carefully, leaving room enough for it to play about easy; thus it will take three stakes to secure twelve of the flower stems, which, if neatly done, will have an elegant effect. After flowering, the tops will soon begin to decay; and when yellow, or dead, the bulbs ought to be taken up and laid away from the sun to dry a day or two; then clean and place them in a dry room, there to remain till the time of planting; look over them occasionally, to see that they are all in good order.

Tulips are known by the following names: *Early Tulips*, which flower about a fortnight before all others; *Bizarres*, which have a yellow ground, striped with brown, purple and violet, with intermediate shades; violet and rose *Bibloemens*, which have a white ground, striped with violet, purple, black, cherry, rose, and intermediate shades: these are considered the most valuable by the florist; *Baguets*, which are nearly allied to Bibloemens, but are much stronger in their growth, and more gross in their colors; *Double* and *Parrot* tulips are esteemed mostly as border flowers.

Yours, J. W. RUSSELL.

Mount Auburn, Cambridge, Oct. 12th, 1835.

[From the American Gardener's Magazine.]

On the Cultivation of Hyacinths in Glasses and Pots.

The following observations, though not written expressly for this Magazine, we have thought might be of considerable interest to many of our readers who cultivate hyacinths and other bulbs. The season is now approaching for planting them, and many may be induced to grow a few, who have heretofore been prevented, from the want of information on the subject. Hyacinths in glasses, it cannot be supposed, will flower as well as when in pots; but they have a very beautiful appearance, and flower sufficiently strong to render them highly desirable.

For this purpose, the earliest kinds should be selected; and we would state, that we prefer single to double ones, or at least an equal number of each, for the following reason: the spikes are much taller, the bells far more numerous, the colors more vivid, and the fragrance very powerful; indeed, in some of the best kinds, the bells are so profuse as to form a complete [illegible] If attention is given to the following simple observations, no fear need be entertained of disappointment.

Select good large solid bulbs, especially for glasses; we have often seen it stated in the communications of experienced growers, that "small bulbs are worse than useless;" it is labor lost, to cultivate those which are sold at *auction*; they are the mere *refuse* of the Dutch florists, such as would be thrown away as worthless; the roots are weak, and would fail to flower well if put in their natural element, the earth; much more so if in an artificial one of water. How frequent we have heard complaints that bulbs start well, make a rapid growth of an inch or two, and then stop; the flower stems dying ere a flower opens. This is from the cause that there is not sap enough stored in the bulb the preceding year; and it must consequently make a premature and sickly growth the following one. Unless attention is paid to the selection of first rate bulbs, disappointment must certainly ensue. All complaints arise from this cause; and if *cheap* bulbs are cultivated, *cheap* looking flowers must also repay amateurs for their care.

Management in Glasses.—The bulbs may be put in the glasses any time from October to January; when a succession of flowers is wanted, they may be put in every fortnight. Place in the bulbs, and then fill up with water just so that the bottoms of each will be immersed an eighth of an inch; then put the glasses in a dark *cool* room until the roots have protruded a half an inch, or so, which is generally in about ten days. They should then be exposed to the sun, light and air, as much as possible. If they receive the sun on one side only, turn them round every two or three days, to prevent their growing crooked. Change the water once a week; if the glasses get very dirty, draw out the roots carefully, and give them a thorough washing. The water should not be allowed to freeze. Any *pure* water will do; but rain water is the best.

After bulbs are grown in water, they are not worth saving; as it will take three or four years to recover their strength.

Management in Pots.—To bloom hyacinths to perfection, the pots should be seven inches in diameter and ten inches deep; plant only *one* in each pot; it is almost unnecessary to say, that it is folly to expect to procure fine flowers from a bulb in a pot scarcely large enough to hold a crocus. Put in some broken potsheds in each pot; fill them up with the soil before recommended, and place in the bulb, just covering it; give the pot a gentle knock to settle the soil. Select a dry spot in the garden, and dig a hole eighteen inches deep; place in the pots, and cover them up with the earth six or more inches in depth; upon the approach of frost, cover them with dry leaves, sea-weed or hay. They should all be planted at one period, during the month of November.

Two or more pots can be taken up at any time throughout the winter, thus giving a succession of flowers from January until April. If there is no garden to place the pots in, they should be put in a box in a *cool* cellar, and covered with earth in the

same manner. This is the method we have practised, and have never failed in blooming them well. We have had the main stems of some single ones eighteen inches high, with upwards of *fifty bells*, forming a pyramid of flowers more than *twelve inches* in height. It cannot be supposed that a bulb, set in a pot and immediately forced into growth, will flower strong; they must acquire roots first to support the foliage.

When they are in flower, give them plenty of water, by placing pans under the pots, and keeping them constantly filled. We have seen manure water recommended, but we have never, ourselves, tried the experiment; cease to give water when out of flower, and discontinue it altogether when the leaves assume a decaying appearance.

Roots that have flowered in pots are but little injured, and will bloom tolerably strong the next season, if set out in the ground; the same bulb should never be set in a pot two successive years, but by shifting them alternately, from the pot to the garden, they may be made to flower vigorously.

The management of the hyacinth in beds, to flower them to perfection, will be given in some future number.

As many of our readers may not know what constitutes the properties of a fine hyacinth, we extract the following from Maddock's Florist's Directory:

"The stem should be strong, tall, and erect, supporting numerous large bells, each suspended by a short and strong peduncle or footstalk, in a horizontal position, so that the whole may have a compact, pyramidal form, with the crown or uppermost flower perfectly erect. The flowers should be large and perfectly double; that is, well filled with broad, bold petals, appearing to the eye rather convex than flat or hollow: they should occupy about one half the length of the stem. The colors should be clear and bright, whether plain, red, white, or blue, or variously intermixed and diversified in the eye: the latter, it must be confessed, gives additional lustre and elegance to this beautiful flower. Strong, bright colors are, in general, preferred to such as are pale."

The following is a list of superior kinds, and may serve to assist some in making their selections:

Double White.
General Washington
Prince of Waterloo
Triumph Blandina
La Deese
Miss Kitty, *rosy eye*
A la Mode, *rosy eye*

Single White.
Grand Blanch Imperial
Grand Vainquier
La Candeur
Duc de Cumberland

Double Yellow.
Bouquet d'Orange
Duc de Berri d'Or
Ophir
Louis d'Or

Single Yellow.
Princess Charlotte
Croesus

Double Red.
Bouquet tendre
Groot Voorst
Marquis de la Coste
Comte de la Coste

Single Red.
Cochineal, *crimson*
La Balaine, *rosy*
Lord Wellington, *rosy*
L'Eclair
Mars, *crimson*

Double Blue.
Grand Vedette, *pale*
Martinet
Habit Brilliant
Comte de St. Priest, *pale*

Single Blue.
La Crepuscule
Grand Vedette
L'Ami de Cœur,

[From the American Gardener's Magazine.]

On the Cultivation of the Potato, during the Winter Months. By P. Q.

Sirs,

I here send you a few remarks on the cultivation of the *potato*, so as to procure *new ones* in the months of February, March and April. About the middle of September, I procure a quantity of sandy loam; exposing it for some time before the sun, until thoroughly dry, when it ought to be put under cover until wanted. About the same time, I look out for large boxes or barrels; they ought to be carried to the place intended for the growing of the potatoes, and for this I should prefer a mushroom house, or, in want of that, they will do very well in a dry, dark cellar, or fruit room, providing they be out of danger of frost. After the potatoes have been well ripened, and taken from the field and dried for a fortnight, at least, I pick out as many of the largest of them as I think I may want; preferring a dry, mealy potato to a *wet one*. Beginning first with a layer of earth, six inches thick, in the bottoms of my boxes or barrels, then with the whole potatoes, placing them entire upon the earth about twelve inches each way, and so continue with a layer of earth eight inches thick, and a layer of potatoes, till you arrive at the top of each box or barrel.

Potatoes may be had in this manner any month in the season, by putting in a successive box every three weeks. I have seen the finest ones taken from a box placed in a mushroom house, where there had been a mild, moist heat, kept up by dung. The old potatoes will vanish away without putting forth any vines, if kept in the dark, leaving new ones to supply their place; I have gathered them in this manner as large as hen's eggs, on the first of February, and very few, if any persons, could tell the difference between them and potatoes grown in a frame; the whole art lies in having the sandy light loam perfectly dry. The process is easy, simple, and well worthy of a trial. In taking out the potatoes, I would prefer lifting earth and potatoes out with a flower pot, instead of a spade, passing the whole through a coarse sieve. Yours, &c., P. Q.

Philadelphia, Aug. 17th, 1835.

[From the American Gardener's Magazine]

Descriptive List of several Varieties of Apales, suitable for planting a Kitchen Garden. By E. M. R.

In answer to the request of "An Amateur," on page 313 of your No. for August, I would recommend the following sorts of apples: there are doubtless a great many other varieties equally deserving cultivation, which I have not had the good fortune to have met with.

Early Harvest. Of rather flat form, and of medium size; of a deep straw color; rather acid, but pleasant; particularly adapted to culinary purposes; may be kept in a sound state for several weeks after it comes to maturity, which is in July. It is to be regretted that this tree begins to show symptoms of decay in some situations.

American Red Juneating. A ve fine fruit, and of great beauty; is equ ly valuable for cooking and the desse The color is a uniform and beautiful re the form globular; the size from sm to medium. Perhaps it is one of most popular summer apples in this cinity. Ripe in August.

Benoni. This fruit has been brou into notice within a few years: it orig nated in Dedham (the parent tree is sti growing); it is from medium to larg size, of a red color, streaked with ver dark red; its form oblong, tapering a the blossom end; the flesh is very firm and of a pleasant flavor for eating; fo cooking it is not thought to be equal t the last named variety; it bears almos to a fault every second year. Ripe i August and September.

Williams's Apple. The fruit is of a beautiful red, and of full medium size; the form oblong and regular, and is quite a popular fruit; the tree is vigorous and productive. The time of its ripening is between the red Juneating and Benoni.

Early Bough, or Sweet Bough.—Some of them attain quite a large size; of a pale yellow color; the flesh is white, very tender and sweet; a fine fruit for eating or baking. Ripe in August.

American Summer Pearmain. This fine fruit deservedly holds a very high place, (none of the foreign varieties, which have come to my knowledge, having surpassed or even equalled it); the form varies from globular to oblong; over medium size; the color, in the sun, of a bright red, faintly spotted with dots of white; the flesh is tender and juicy. On the authority of Mr. Coxe, it is "frequently preferred to a fine pear;" the tree bears abundantly. In eating in August and September.

Pumpkin Sweeting. A very large apple, flattened at the stalk and blossom ends; color of a bright russet; the flesh very sweet and good flavored; fine for baking, and is quite a tolerable fruit for eating; superior to most baking sorts; the tree is of upright and very vigorous growth. In perfection in September.

Porter. This variety originated in Sherburne, and is of rather large size; the form oblong and regular, and of a bright straw color; the flesh is high flavored, and it is justly considered a fine fruit. September.

Maiden's Blush. This is now considered by many to be synonymous with the *Hawthornden*; it is of a flat form, and of great beauty, having a very delicate blush on one side of those exposed to the sun; while those growing in the shade are of a very light straw color; a first rate fruit for cooking, and its great beauty entitles it to be classed among the varieties suitable for the dessert. September.

Fall Pippin. A fine fruit, of very large size; form oblong, with ribs on its sides; the color a greenish yellow; its flavor is fine and sprightly, and for a fruit of its size, I have not seen its equal for good qualities. November.

SOPS-OF-WINE). I believe this very high flavored fruit was introduced by Mr. A. D. Williams, of Roxbury. The description of an apple called "*Sops of Wine*," (Py. Mal. Brent, plate II.), bears a strong resemblance to this variety. Au-tumn.

Among other desirable fruits, principally of American origin, but which a particular description of must be deferred, are the following:

LYSCOM, known also by the names of *Matthew's Stripe*, and *Osgood's Favorite*, —a very superior autumn fruit.

STUMP, or BOXFORD. A striped apple of great beauty, and also a fine autumn fruit.

HUBBARDSTON NONSUCH. Winter.

LADY APPLE, second quality, but of great beauty, and productive, (an old variety). Winter.

ORTLEY, or WOOLNARY LONG, a first rate fruit. Winter.

PENNOCK'S RED WINTER, very agreeable flavor.

RHODE ISLAND GREENING, succeeds well on light soils.

ROXBURY RUSSET, requires a moist rich soil.

WINE APPLE, winter; and DANVERS WINTER SWEET.

BALDWIN, winter; and MOORE'S SWEETING, a very late keeping fruit.

E. M. R.

Dedham, Sept. 7th, 1835.

[From the London Horticultural Register.]

CULTURE OF THE CAULIFLOWER.

The ground on which the cauliflower plants are intended to be planted can scarcely be made too rich, therefore lay on a large portion of rotten dung, and dig it well in.

The best soil in which to sow the seed is one somewhat light, and for the first spring sowings rather rich; at all other sowings this is not material.

Always plant in open, airy situations, for the plants will never form good heads under the shelter or drip of trees, sometimes none at all.

The varieties known amongst us are only two, the early, and the late. The difference betwixt them is very trifling; the one called the *early*, has a slight purple or red color in its stalks, and probably is a little harder than the other, and therefore is generally sown in the autumn, to preserve in frames or under hand glasses, for the first crop in spring.

Cauliflowers are raised annually from seeds, and are liable, like cabbages, to be impregnated by bees, &c., during the time of flowering.

There are three principal seasons for sowing, and all three require some little difference in their treatment.

First Sowing Season. — This continues from February, to the end of March, and the plants are intended to succeed those sown the previous autumn. During this season, two sowings are usually made, one in February, and the other in March; both require precisely the same treatment, which may be stated as follows:

Make a hotbed about two feet six inches thick, and as broad and long as may be necessary, for the seed intended to be sown, and cover it down with lights, to draw up the heat, and let it remain about a week to settle, which will reduce it to something less than two feet; then take off the frame, and level the surface of the bed nicely, and replace the frame again on the bed.

This being done, lay about six inches thickness of light rich soil, and on this thinly scatter the seed; sift a little soil over the surface, just to cover it. On the same bed, both radishes and celery may be sown, as they will interfere very little with each other by being mixed.

After the seed is sown, cover down the frame, and so let it remain, until the young plants begin to appear, which will be in a few days. Then give air, and in a few days afterwards remove the lights altogether, during the day, and merely shelter them at nights from sharp frosts, or heavy dashing rains. Or, if the frame be wanted for other purposes, it may be removed altogether, and the bed merely sheltered by hoops and mats.

If it is not convenient to spare a frame for the purpose, one may be made of turf walls, about eight inches high in front, and twelve at the back, and by laying a few bearers across, it may be readily covered with mats, or even hoops will answer the purpose very well. And should the cultivator not have the conveniency for making a hotbed, delay the sowing till March, and select a nice warm border facing the south.

When the plants have become an inch high, prick them out, about three inches apart, either on a warm south border, of light rich soil, or on another slight hotbed; and from this nursery bed, they will be taken to their final destination.

The second crop should be sown in the last week in March, either on a slight hotbed, or on a warm border, which answers the purpose exceedingly well at this time of the year.

The second Sowing Season.—The sowing at this season is to produce what are usually termed the Michaelmas crop of cauliflowers. This sowing should take place about the third week in May, and a shady border should be selected for the purpose; or if the weather becomes very dry, the plants will suffer notwithstanding all the care that may be taken in watering.

Prick out the plants, when large enough, as recommended for the early sowings, and allow them to remain there until the third week in July, when they may be transplanted into the situations where they are to form heads.

Third Sowing Season.—This season extends from the middle of August to the middle of September, and is intended to produce plants to stand the winter, and to plant out early in the spring for the main early crops, which are generally the finest. We prefer sowing this crop about the second week in September, because when sown in the middle or towards the end of August, they often become too large before winter, and are more liable to be injured by frost, unless they are checked in their growth, which often ends in their buttoning; that is, forming small heads very early in the spring, which, to say the least, is a very great disappointment.

Sow the seeds on a warm border in light soil, and when they are large enough, which will be about the beginning of November, transplant them in the situation where they are intended to stand the winter. This is either under a south wall, where they will receive no covering, under hand glasses, or in frames.

Where the cultivator has not a frame or hand glasses to spare for the purpose, they will do remarkably well if planted as close under a south wall as they can be placed; and if the weather be very severe, a slight shelter may be given them, but in general, this is unnecessary. These will not be quite so early in forming their heads as those in frames, or under hand glasses.

Planting under Hand Glasses.— Prepare some rich ground, in a warm situation, for this purpose, by digging in a good quantity of rotten dung. Then place the hand glasses about four feet distant from each other, and proceed to plant from six to twelve plants under each, according to the size of the glass. If the day be dry when they are planted, it will be necessary to give them a little water; place on the glasses, and keep them close shut until they begin to grow; then raise the glasses on the south side, with a brick, to admit air in fine weather, being particularly cautious not to keep them too tenderly.

In fine mild weather, during winter, take the glasses entirely off all day, but in frosty weather, and very heavy rains, secure them well from being affected, otherwise in spring, most of the plants will be lost. They may be easily secured from frost by mats or litter, and from rain, by shutting the glasses closely down.

It is very possible, that in mild weather, towards spring, the plants will be infested by slugs; the evils resulting from these may be prevented by sprinkling quick-lime round each plant, or sowing it all over the ground amongst them.

Keep them sheltered by these glasses till towards the end of April, (continuing fully to expose them in all fine weather, and secure them from frosts;) at which time they will have been thinned out to three or four under each glass, and those drawn out, have been planted in the situations appointed for them to produce heads.

Planting in Frames.—Place the frame on a south aspect, and in the beginning of November, or the end of October, transplant the cauliflower plants in rows, four inches apart, and three inches from plant to plant in the rows; place on the lights, and keep them close shut down, until they begin to grow, then give air in fine mild weather, as recommended before, for those in frames; but secure them from frosts by mats or litter.

☞A method we have practised at Chatsworth, for some years, may be safely depended on, for producing heads somewhat earlier than can be obtained by the usual mode of planting in frames. This is, by potting a number of fine plants in 60 sized pots, at the end of October, and plunging them in the frame, with the other plants. On the approach of spring, if these roots have filled the pots, it would be advisable to place them in layer; they will greatly outstrip the others in growth, and at the end of April, when they are planted out in the open ground, they will be a good size; and meeting with no check in their removal, they will speedily form their heads.

Some persons keep the pots in a vinery, or other house, where a moderate heat is kept; we have tried this plan with success, but they are liable to button, after being turned out;

Final Culture, &c., of the three Crops.— The mode of final culture for all is much the same in substance, but differs in detail, in consequence of the seasons at which they are sown; so that it becomes necessary to treat of them separately. And first;

Final Culture of the First Sowing.—In the beginning of May, prepare to plant them in their final destination, which must be on an open, rich quarter of the garden, well manured for the purpose:

Take up the plants carefully from the nursery beds, with good balls, and plant them on the quarter prepared for them, in rows four feet apart, and two feet six inches from plant to plant in the rows.

If the weather be dry, water them as often as they require it; either with manured water, or not, as may be convenient; the former will stimulate the plants to grow finer.

The plants raised from the second sowing, at this season, should be finally planted on a rich north or north-east border, where they will produce heads from the beginning of August.

Final Culture of the Second Sowing.—About the end of the second week in July, plant these, as recommended for the last, on an open quarter. Give them water as often as they require it, and they will begin to produce heads in October; and, if the weather be mild, will continue to do so throughout November and December.

Preserving during Winter.—There are many ways of doing this, a few of which we will detail:

Cut them on a fine dry day, strip off all the leaves, except those close to the head, and bury the heads under dry peat earth; this plan answers very well, for keeping them, but they become so filled with dirt that they rarely or ever can be got wholly free from it again.

Another way superior to the last, because they are not so liable to be dirtied, is to put them in boxes or small barrels, and bury them in a stock of turf, such as is used for burning. We believe this was originally practised by Mr. McIntosh, who detailed it in the Gardener's Magazine; this system, however, has its disadvantages, for the close confinement of the heads in boxes or barrels gives the vegetables an unpleasant taste.

They also keep exceedingly well buried in sea sand, perhaps better than in any thing else yet made use of; but they are liable to the objections made against the first system; namely, becoming filled with grit, which can scarcely ever be removed; and another obstacle presents itself here, sea sand cannot be obtained without greater expense in inland counties, than the value of the cauliflowers would warrant.

A system is mentioned in the Caledonian Horticultural Transactions, which consists in burying the whole plants out of doors. On a fine day, dig a trench close under a wall, wrap the leaves well aoout the heads of the plants, and place the plants head downwards in the trench; then lay the soil lightly over them, in a sloping direction from the wall, and smooth off the surface with the spade, that it may carry off the rain. This system, however, we can say little about, having never tried it.

Another plan often practised, is to draw up the whole plants on a dry day, and without trimming off any leaves, hang them up by the heels to the roof of a dry, airy shed; the only objection to this plan, is, that the heads lose all that beautiful crispness, and become flabby, and less pleasant to the taste.

Another, and a still better plan, is to take them up in fine weather, with good balls, and plant them in good light rich soil in a brick shed, mushroom shed, or any other convenient place of the kind; and if kept free from dead leaves, they will soon form their heads in that situation, and be very good for table.

But the best method we have met with, where there is the conveniency, is to plant them in a brick pit, when severe weather comes on, and by removing the glasses in fine weather, and preserving them from foul, we have cut very fine heads, as good as could be grown out of doors, until the middle of February, when the winter was very severe.

Final Culture of the Third Sowing.—About the middle of April, take up those plants with good balls, that have stood the winter under walls and in frames, and plant them in the situations appointed for them to form heads.

Take up all, except three or four of those remaining under hand glasses, and supply all deficiencies, about the end of March. Draw a little earth round the stem of each, give them plenty of air, by propping up the glass on the south side, and as the plants advance in growth, raise the glasses all round by means of bricks, and finally, about the beginning of May, remove the glasses altogether.

The crops will, therefore, come into use as follows:

1. Autumn sowing for preserving through the winter.

a. Those potted, and preserved in frames, and finally planted under hand glasses, at the end of March, will produce heads early in May.

b. Those growing under hand glasses, either planted from the frames at the end of March, or having stood there all the winter, will produce heads by the end of May.

c. Those removed from the frames in April, to the open quarters in the garden, will produce by the middle of June.

d. Those sheltered under walls, and planted in open quarters in April, will produce by the end of June.

2. Those sown on a hotbed, in February, and planted out finally in May, will produce heads by the end of July or beginning of August.

3. Those sown on a warm border, in March, and finally planted out in May, will produce by the middle of August, or towards the beginning of September.

4. Those sown in May, and finally planted out in July, will begin to produce in October, and continue through the winter.

Insects and Diseases.—Whilst young, they are often destroyed by the ravages of slugs, and when grown to a large size, they are often infested by caterpillars, particularly those of the green-veined white butterfly, (*Pontia Napi,*) which secrets itself in the head, and is hard to be discovered, the turnip butterfly, (*Pontia Rapæ.*) The cabbages brightline moth, (*Mamestre Oleracea,*) and the common cabbage moth, (*Mamestre Brassicæ.*) The only way of keeping clear of these is to hand pick them.

They are also infested with the larvæ of a fly, which causes the clubbing at the roots; many means have been adopted to prevent this, none of which, to the best of our knowledge, are efficient remedies. Charcoal dust has been found to have a good effect as a preventative, when spread over, and dug into the bed, and soot has been found to have a similar effect, but neither can be depended upon, at times.

MANAGEMENT OF MILCH COWS.—We were much astonished a few evenings since, while conversing with a very intelligent gentleman, who owns a farm in this county, to hear him say, that during the last winter his milch cows, which were kept warm in the stable, did not look as well as his dry cows and other cattle, which were exposed in the barn yard under sheds, that merely protected them from the rain and snow. We were not surprised at the result of the two modes of keeping, for that was but the natural effect of the different relations of the animals; our surprise sprung from another quarter—from the declaration that our friend made, that the coming winter he would keep his milch cows in the barn yard with the other cattle. The cow kind, we are aware, are warm blooded, hardy animals, and can bear great intensity of cold, so long as they are fed well with good strong nutritious food, and will take on fat tolerably kindly, even when exposed to winter winds and frosts; but it is impossible to keep milch cows to the pail, so as to yield even a tolerable supply of milk, unless they are kept *warm*, and fed generously with wholesome, nourishing food; for it is utterly impossible that those delicate vessels, or thoracic ducts, which secrete the milk, can perform their office efficiently, while the poor animal is shivering with cold, exposed to the searching winds of a December day. The secretion of fat, may probably go on unobstructed, or but partially so, under such exposure. The cause of our astonishment arose especially from this circumstance—that the good sense of our friend should not have enabled him to account for the superior appearance of the dry cattle over those that were giving milk. He should have recollected, that while the feed consumed by the former was solely required for the accumulation of *fat*, the poor milch cows had to supply the *additional demand for chyle for milk*, and that what would keep the one *fat*, would not be more than sufficient to preserve a decent appearance in the other. This is the *rationale* of the phenomenon, if we may so term it. It was not because exposure to cold winds and pinching frosts suited the constitutional habitudes of his cattle better than a warm and comfortable birth in his stable, but that what they ate was solely required for purposes of obesity, whereas the food consumed by the milch cows had to answer the two-fold demand of fat and milk. It is well known to every one in the least acquainted with animal economy, as indicated in the cow species, that a deep milker and a very *fat* cow, is but too seldom found in the same animal, at the same time, while on the contrary, deep milkers are uniformly more *prominent* in *points* than flesh. We hold it to be an indisputable proposition, that no cow will give a copious supply of milk through the winter, unless she is well and comfortably kept, and fed with succulent food.—[Baltimore Farmer.]

[From the Cultivator.]

BERKSHIRE PIGS.

MR. BUEL—Sir,—If your patience is not already exhausted with my *piggish epistles*, I will trouble you with this, my last.

The Berkshire breed of pigs, now in my

possession, were imported by Siday Hawes, Esq., in 1832.

Previous to his leaving England to settle in this country, Mr. H. spent some time in search of the *best breed* of pigs to introduce here, and finally settled upon the Berkshire, as uniting the most desirable qualities; viz., *good breeders, early maturity*, and *great aptitude to fatten*. They are thick, short legged, round bodied animals; remarkable heavy in the hams, and very peculiar for smoking, being more lean than fat, and may be killed at any weight from 25 to 700 lbs.

I have tried this cross with my *Improved China*, and was much pleased with the result. A pig is now fattening, which, when killed, you may hear the result.

This breed of pigs is spreading over the country—having sold them to Edwards Ogden, Esq., of New-Orleans—J. Elliot, Esq., of Tuscumbia, Alabama—Geo. S. Attmore, Esq., Newburn, N. C.—A. A. M. D. Robinson, of Kentucky, and to gentlemen in various parts of this State. I have only a few males on hand for sale. My price for these, as well as the Chinese, is ten dollars a pair, not over eight weeks old—after that age twelve and a half cents per pound extra for all over 45 pounds.

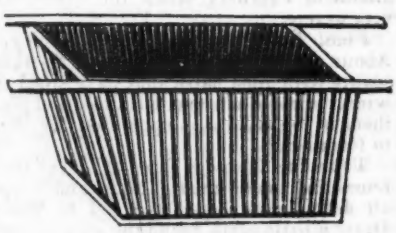
The above cut represents a Berkshire pig—and from "Parkinson's Treatise on Live Stock," I have transcribed the following account of this celebrated breed.

"The Berkshire pigs are distinguishable by their color and shape. Their color is spotted white, and some are sandy with small black spots irregularly all over them—a few are entirely sandy. The hair is long and thinly set, but much curled, looking very rough, and the real true breed feather-eared, which looks rather unseemly, but is found not to be an imperfection. The hair indicates a coarseness, as if their skins were thick, but they are quite the reverse, the best sort, although very large, remarkably thin in the rind, and equally fine in the flesh; they are, with very few or any exceptions, better known by their hair than by any other appearance, and the best of these pigs have no bristles; indeed, so remarkable are they in that respect that those I took to America received the name of 'Parkinson's no bristle pigs.' The Americans were so partial to this breed that I sold sucking pigs weighing 30 and 32 lbs. each, when seven or eight weeks old, at $20 for a sow, and $30 for a boar. I sold a sow pig at six months old for $70. One sow of this kind made $125 in eleven months: and Gen. Stone offered to lay 100 guineas that he would raise two of these pigs, and produce an increase of one pound a day for a whole year. This bet was offered in a public company and canvassed over, but was not taken, as their perfections had been seen. I knew a pair of the same breed, killed at the age of one year and a quarter, which weighed 41 stone, consequently, the pig's age being 456 days and the weight 574 lbs., the increase for the time was 1 lb. 4 oz. and 9 ds. a day."

I have purchased of E. Phinny, Esq., of Cambridgeport, Mass., a sow pig of a breed very famous in that State, known as the "*Mackey Breed*," which have taken several premiums at Brighton and other fairs, with which I intend crossing with my China and Berkshire as an experiment. I also engaged of a gentleman near Charlestown a pair of pigs of the same breed, but from some cause or other, they have not yet come to hand.

I have also a pair of pigs which I procured of Judge Geer, of Glens Falls, very celebrated in the county of Saratoga, for great weight, having attained at 9 months 300 lbs. It is my intention to keep each breed pure and distinct, as well as to try the different crosses. Should I be successful in my experiments, you may hear from me again.

CALEB N. BEMENT.



[From the same.]

NEW CONTRIVANCE.

JESSE BUEL—Dear Friend,—Having found it troublesome to boil potatoes for my stock in a pot ash kettle, and to get them out of the water when cooked, I had a thing made that has very much lessened the difficulty.

It is a square wooden basket about 24 inches at top, 20 inches at bottom, and 17 inches deep; frame of oak 2 by 1½ inches, with oak slats of 1 inch, and same distance apart, to fill sides and bottom, two of the top rails projecting at each end, made longer than the diameter at the kettle, serving as handles to lift the basket and as a rest on the brim of the kettle for the purpose of keeping the potatoes above the water in it. I first put the potatoes into the basket, and by throwing upon them a few pailsful of water, and a person at each end lifting and shaking them, most of the dirt is washed out: then set the basket in the kettle with only water enough to reach the bottom of the basket, throw a piece of old carpet over the kettle to keep in the steam, make a brisk fire and the potatoes are soon *fit to put on a table*.

A boy at each end can lift the basket out, refill, and set another mess cooking in a short time. A little hot water should be added as each new mess is put into the kettle, to replace the waste by steam.

In the last Cultivator, under the article "*The Roller*," you speak of "*the spiked roller*, which is used for pulverizing stiff soils preparatory for wheat." I was before ignorant of such an implement, but had concluded to make one for the purpose of disturbing the moles, which are numerous and destructive in my newly made clover fields. It has also occurred to my mind that a narrow rotary harrow may be constructed to till growing corn advantageously, and I mention it in hopes that some ingenious person may propose a model, or construct one.

Thy assured friend,
ROB. WHITE, Jr.

Shrewsbury, 10th Mo., 1835.

SUBSTITUTE FOR INDIGO.—A Company has been formed in London for the manufacture of a substitute for Indigo, from whose prospectus the following are extracts. "The objects of the Company are to encourage the manufacture, and to bring into general use, the *British Substitute for Foreign Indigo;* and to dye wool, stuffs, cloths, silks, and other fabrics *blue or other colors* (for which indigo is now used), with this substitute, in the preparation of which a new and wide field will be opened to the industry of this country.—By the use of the substitute, a considerable saving will accrue to the manufacturer, and the colors produced, such as *blues, blacks, greens, bronzes, browns, and various others* will be so fast as to resist the action of *light, air, and friction*. The articles so dyed will not turn white at the *edges or seams*, a quality long sought after, particularly in stuffs or cloths for furnitures and other purposes, in which exposure to light and heat is inevitable, and hitherto has proved destructive of their colors. Independently of fastness, a brilliancy of color will be produced by the *substitute*, which cannot be attained with *indigo*." "For more than half a century the first chemists of Europe have directed their best energies to the discovery of some means by which a perfect and uniform blue dye (other than indigo) might be obtained. Hitherto their researches have been unsuccessful, insurmountable objections presenting themselves in the caustic qualities of Prussian blue (the only known substitute) in some processes hardening the wool when dyed and rendering it difficult to work, and in others destroying its fibre. At length a process has been discovered, for which a patent has been obtained, effectually neutralizing the objectionable properties of the component parts of Prussian blue. A patent has also been obtained for the manufacture of the prussiates of potash and soda, rendering them fit for many purposes to which hitherto they have been inapplicable, whilst they are in every respect, in conjunction with certain ingredients, a perfect substitute for indigo as a dye for wool, &c. Facts which have borne the test of extensive experiment, demonstrate this substitute in all respects to be equal, and in many superior to, far exceeding in brilliancy and durability, any dye obtained by the use of indigo. By a new process (also patented) the wool may be dyed either in the flock, the fleece, the yarn or skein, or when woven into cloth. So also cotton, in skein or piece, silks and all organic substances, may be dyed with facility of any shade, and of a fast and durable color. The manufacture of hats may be materially improved by this discovery, because a most brilliant and fast color is produced by using the ingredients alluded to in the combination forming a black, which will resist the action of light and air, elements fatal to indigo. The materials of which the substitute for indigo is composed, are in great abundance both in England and Ireland, but at present they are in most instances wasted. Their conversion into prussiate would provide extensive employment to that class of society (particularly in Ireland) who stand most in need of it, viz., the most indigent, as will be apparent from the following observations. The articles alluded to are blood, horns and hoofs of animals, bones, fish, cuttings of leather, old harness, and all other kinds of animal substance, old woollens, the refuse of woollen manufactures, old garments, &c. Substances the best calculated for the purpose, such as blood, fish, &c., are not rendered less useful by being in a corrupt state, for even animal manure may be used with some advantage. It is well known that in Ireland, the quantity of cattle slaughtered for the Government service, for export, and for the supply of our mercantile marine, is very considerable. The blood of those animals is now almost all wasted, as well as a great quantity of other animal matter forming the offal. The same remark applies to many parts of England, where, in numerous instances, those really valuable substances are not only unproductive of benefit, but entail great ex-

pense in the very prevention of their being productive of injury. Whole cargoes of fish are frequently thrown away in consequence of their corrupt state. Inconvience and loss, therefore, are the least part of the argument, as their causes but too frequently contribute to engender sickness and contagious maladies; so that a demand for, and consumption of these substances, even in a corrupt state, would not only open a new source of employment to the poor, but would very materially tend to the salubrity of all the principal towns in the United Kingdom, freeing them from filth and contagion. This discovery, therefore, it is submitted, ought, if for this reason only, to be looked upon in a national point of view, as offering, among inferior benefits, certainly a new source of employment for the indigent classes of this kindgdom, and above all, a remedy against the accumulation of impure matter corrupting the atmosphere of our populous towns. The articles combined with animal substances in the preparation of the new dye, are potash or soda, acid, and iron. Any object causing an increased consumption of the first mentioned article would materially benefit the Canadas, and improve the situation of our emigrants in that quarter of the world, promising as it is at present. But should potash become scarce, soda will answer every pupose in the manufacture of the substitute for indigo, and an increased demand for that article might advantage the poor both in England and Ireland, were they to be employed in converting salt into soda. The same observation applies to a new demand for acids, particularly since muriatic and sulphuric acids will be principally employed in these operations, and they are, almost exclusively, the produce of Great Britain. In reasoning on the foregoing observations, it may be necessary, 1*st*, To give a statement of the actual quantity and value of the indigo consumed; 2*dly*, To compare that value with the estimated cost of the substitute for it; and, 3*dly*, To point out some of the advantages which cannot fail to arise to our manufacturers from the use of the substitute. As regards the first, reference being made to Marshall's Statistical Tables, it will appear that the average annual quantity of indigo entered *for consumption*, from 1814 to 1831, both inclusive, was 2,438,245 lb.; that is to say, the quantity remaining, after deducting the quantity exported from the gross quantity imported, will give the average prefixed. But the same author states, that the quantity thus arrived at is not the true measure of consumption, since the stock on hand and in bond at the commencement of this era has been gradually decreasing. The average quantity consumed in Great Britain may, from these data and corroborating information, be taken ut three millions of pounds per annum. The prices of the eighteen years aggregated give—

	s.	d.		s.	d.
For low qualities,	53	7	*a*	75	4
And for fine qualities,	178	2		204	0
	231	9		279	4
				231	9
				511	1

leaving, as a result from the general average of the eighteen years, a medium price of 7*s*. 1½d. per lb. The price of indigo is not lower than it was in 1831; whilst the manufacturers are now induced by experience to employ the finer description of indigo, finding their advantage in so doing exceeds economy in price. But as the valuable tables alluded to cannot extend to a perfect computation of the relative proportions of fine, middling, and low qualities, a mean price of 5*s*. per lb. will be assumed in the following observations, at which price the value of the indigo annually consumed would amount to £750,000. As regards the second and third remarks, it may only be necessary to state that the cost of the substitute need never exceed an average of 2*s*. per lb. It would thus produce an annual saving of £450,000, independently of the material consideration, that the gross amount of cost, £300,000, for the manufacture of thesu bstitute, would be expended on what is now wasted in this country, and in the labor of its poor inhabitants. The saving in the cost of the dye would enable the manufacturer to increase the wages of his workmen, or to sell the articles he may produce at a lower rate than those persons can who may continue to use indigo. The beneficial consequences would soon be felt in foreign markets, where English woollens are affected by a tariff on their declared value or cost of production, as in the United States of America, South America, Mexico, Hayti, and in some parts of the continent of Europe. There the British manufacturer would be enabled to undersell the woollen manufacturers of Germany, &c.; and this observation applies equally to cotton and other articles. At present the woollen manufacturers of Germany are underselling the British, in consequence of their purchasing indigo equally low, and procuring labor at a more moderate rate. In Ireland, formerly, an extensive manufacture of woollens was carried on; now, the greater part of those establishments are closed; but with capital (not large), and the advantages provided by the substitute for indigo, they might be put into a state of activity, giving to the population what chiefly they require—employment, to render them as industrious, peaceable, and contented as any subject in his Majesty's dominions. The subject is open to another important remark: Indigo is an article liable, in the event of war, to an immediate and a very considerable rise, by reason of an increased value of gold and silver, the increased charges for freight, insurance, and commissions, consequent thereto; whereas, the price of the principal ingredients in the substitute for indigo would, in all probability, be decreased by the contingency becoming yet more abundant, in consequence of the extension of the Government contracts for salted provisions. The Government of France, under the Emperor Napoleon, offered a reward of one million of francs to the person who should discover a substitute for indigo in dyeing woollens. That offer cannot now be made available; but the King of the French takes a lively interest in this discovery, and would desire to reserve its advantages exclusively for France. Samples of wools and cloths dyed by this new process were exposed at the late public exhibition in Paris, and orders have been issued by the French Government to prepare with it cloth for the clothing of part of the French army. Samples of these cloths, and of wools dyed on the new plan, are now in London, and may be inspected at the Company's Office; as also samples of cloths and stuffs dyed in London, at Messrs. Green and Whiteheads. Among these specimens are some literally worn threadbare—the color still as fresh as when first dyed. To revert to the question of economy, let it be observed, that, in using the substute for indigo, one pound of it will dye a larger quantity of material than the like weight of indigo."—[Edinburgh Quarterly Journal of Agriculture.]

[From the Cultivator.]

NEW MATERIAL FOR MAKING PORK.—We have long known that apples would fatten hogs, but until we received the following communication, it had never entered our mind, that *apple pomace* could be successfully employed for this purpose. The statement of our correspondent would have been more satisfactory, if the weight and value of the hogs in the spring, or previous to their having been put up to fatten, had been stated. There is little doubt, however, that the apple pomace contributed essentially to augment the quantity of pork, and the more so in consequence of the cooking process, and as it did so, was manifestly clear gain.

"While addressing you, permit me to give you an account of my experiment on hogs this season. On the 15th October last, I shut up to fatten eleven hogs, about fifteen months old, and six shoats which were pigged on the 15th May last, having given to the whole nothing during the summer but the wash from the dairy, with a small orchard of about an acre and a half of ground, where they eat the premature apples that fell. I proceeded to fatten them by steaming six bushels of small potatoes with fourteen bushels of apple pomace, and one hundred weight of buckwheat canal [bran,] the whole incorporated well together, while hot from the steamer, with a wooden pounder, adding to the mixture the dairy wash, and supplying them with a plenty of charcoal and pure water. They were divided into three lots, and closely confined. I continued to give them this mixture until nine days before they were killed, during which latter period they were fed with corn. They were slaughtered on the first of December. The expense of fattening and the product, in pork, pigs, &c. are as follows:

30 bush. small potatoes, at 2*s*. 1d.	$9 37½
8 cwt. buckwheat canal, 8*s*. per cwt.	8 00
21½ bush. corn given the last 9 days,	13 43
Apple pomace, say	00 00
Total expense of food,	$30 80½
Cr. By 36 cwt. 50lbs. pork at $5,	$182 50
50 roasting pigs sold during the summer,	50 00
6 shoats sold alive,	12 00
4 do. on hand, worth	6 00
	$250 50
Deduct expense,	30 80
Balance,	$219 70

Respectfully, THOS. MEDFORD.

Ball Farm, Hyde Park, Jan. 1, 1835.

REARING CALVES.—The following is the general method of rearing calves in Britain, and differs not materially from that followed by Bakewell, the great cattle breeder.

"The calves sucked for a week or fortnight, according to their strength; new milk in a pail was then given a few meals; next new milk and skim milk mixed, a few meals more; then skim milk alone, or porridge made with milk, water, ground oats, &c., and sometimes oil cake, until cheese making commenced, if it was a dairy farm; after which, whey porridge, or sweet whey, in the field, being careful to house them in the night, until the warm weather was confirmed. Bull calves, and high-bred heifers, however, were suffered to remain at the tile until they were six, nine, or perhaps twelve months old, letting them run with their dams, or more frequently less valuable cows, or heifers."

☞ AT A MEETING OF THE NEW YORK HORTICULTURAL SOCIETY, held at its rooms on the 6th instant, the following Report was read, and ordered to be published:

REPORT.

The following gentlemen, members of the Inspecting Committee of the New York Horticultural Society, appointed judges of the exhibition of Dahlias, beg leave to submit the following Report.

Agreeably to the rules and regulations adopted at a meeting of the Society, held at its rooms on Tuesday, the 8th of September last, the Committee proceeded to discharge the duty assigned it, of awarding the different premiums for Dahlias to the different competitors for prizes, and after a strict, careful, and impartial examination, decided on the following distribution thereof, viz.

The first premium for the best six self-colored seedling Dahlias, is awarded to the number designated by the Committee of Arrangements as No. 5, and was presented by Mr. Thomas Dunlap.

No second premium is awarded, no person having three variegated seedlings in conformity with the requirements of the rules.

The third premium for the greatest and best variety of seedling Dahlias, is awarded to the number designated by the Committee of Arrangements as No. 6, and was presented by Mr. Wm. Reid.

The fourth premium for the best 12 self-colored imported Dahlias, is awarded to the number designated by the Committee of Arrangements as No. 2, and was presented by Mr. Wm. Reid.

The fifth premium for the best six variegated imported Dahlias, is awarded to the number designated by the said Committee as No. 5, and was presented by Mr. Thomas Dunlap.

The sixth premium for the greatest and best variety of imported Dahlias, is awarded to the number designated by said Committee as No. 5, presented by Mr. Thomas Dunlap.

Although the flowers presented at this year's exhibition were, in point of beauty and variety, (in the opinion of the Committee) vastly superior to those produced at any former exhibition, the number of competitors in prize flowers was comparatively few. Notwithstanding that the season was not as propitious for the bloom of Dahlias as it might have been, (in consequence of the continued drought,) still it is difficult to conceive that a more splendid and beautiful display of this chaste and gorgeous production of Flora could have been procured under the most favorable auspices. All of which is respectfully submitted.

(Signed) JAS. K. HAMILTON,
BENJ. McVICKAR,
ALEX. KNOX, Jr.

The Society also acknowledge contributions from the following gentlemen, viz. Messrs. Thomas Hogg, Michael Floy & Son, Alexander Smith, Noe & Boll, Andrew Hyslop, Thomas Bridgeman, George Davis, J. Hitchcock, J K Hamilton, Dr. McVickar, Aaron Arnold, F Panton, Dr. Guilford, I M Catlin, Wm Neale. I Thorborn, J G King, Dr. Pennell, James Martin, Wm Prince & Sons, J Hoyt and J Brown, jr of New York and its neighborhood—and also from Messrs. R Binet, R Carr, Dryburgh & Sherwood, Henry Pratt, B M Ogden, Alex Packer, — Hobson, and Anthony Tielton of Philadelphia—Mr Daniel McAvoy of Bristol, and Mr David Allen of Burlington, New Jersey, who sent some very fine Beurré and Vergoloo Pears. To the above named gentlemen, the Society tender their sincere thanks, for their kindness and liberality, in sending such a great quantity of splendid Flowers, as rendered the late Exhibition unprecedented, in this country, for beauty and gorgeous display. JAMES HOGG, Secretary.

Nov. 10, 1835.

THE SECKEL PEAR.—In mentioning the fact, a few days since, that some of the fruit of the *original* Seckel Pear tree formed a part of the collection at the late Horticultural Exhibition held in this city, we stated that the tree was known as far back as 47 years. We are now able to state that there are amongst us gentlemen who can trace its existence to a more remote period. The venerable Bishop White, whose memory is remarkable for its strength and correctness, says, that when he was a boy, about seventy years ago, there was a breeder in this city known by the name of Dutch Jacob, who was a great sportsman. At a certain season of the year he was known by his neighbors and others to bring home from his excursions very delicious pears, but he would never tell any body where he procured them. About that period, the London Land Company, which owned some land below the city, made a sale, and Dutch Jacob purchased the lot upon which his pear tree stood. It afterwards became the property of Mr. Seckel, and now belongs to the estate of the late Mr. Girard. The Seckel pear is now known all over the United States, and we presume in many parts of Europe, as one of the most delicious of fruits.—[Phil. Gaz.]

The following excellent article in relation to "Apprentices' Libraries," and the manner in which *apprentices* ought to spend their leisure time, is from the Buffalo Commercial Advertiser. It contains advice which, if duly appreciated, will be the means of making many a wise, happy, and affluent mechanic, in that "City of the Lakes," which but a few, say *twenty* years since, had *scarcely a mechanic to boast of*; whilst it now numbers its — thousand inhabitants, and will soon vie with many of the Atlantic cities.

APPRENTICES' LIBRARY.—As the long winter evenings are approaching, when time and business afford an opportunity for improvement in the intellectual resources of the numerous apprentices of our city, we would call their attention to the Society which has been established for their especial benefit. By the liberality of our citizens, a respectable library has been collected, which, were its benefits properly appreciated, would effect a great change in the moral and intellectual condition of many apprentices who are wasting their time in worse than useless amusements, which have a tendency to vitiate their habits and ruin their characters. Let them but employ the moments now dissipated in idleness, in the reading and discussion of works of a practical character, and they would acquire a fund of useful information, which, in after life, would be of incalculable worth in all their relations with the world. Youth is the time — the only time — which may be properly set apart for this object; and if it be squandered with impunity, in future years, lasting regret will come over the improvident, and they will in vain recall to their minds the many opportunities lost, which might have advanced their happiness and their respectability among their fellow men. In a city like ours, a thousand attractions present themselves to the young, and if they give way to the indulgence of their curiosity in one point, they may in another, until wholly absorbed in the gratification of present propensities, without once thinking of the future, or the results which flow from an early compliance with their own inclinations or the entreaties of others. Let them adopt the principle of *total abstinence* from all *useless* amusements, and only indulge in those from which some practical good will result, and a mighty change would be wrought among them, which would be felt throughout the mechanical portion of community.

THE CITY OF DORT, IN HOLLAND, PRESERVED BY MILKMAIDS.—During the wars in the Low Countries, the Spaniards intended to besiege the City of Dort, in Holland, and accordingly planted some thousands of soldiers in ambush, to be ready for the attack when opportunity might offer. On the confines of the city lived a rich farmer, who kept a number of cows in his grounds, to furnish the city with butter and milk. His milkmaids, at this time, coming to milk their cows, saw under the hedges the soldiers lying in ambush, but seemed to take no notice; and having milked their cows, went away singing merrily. On coming to their master's house, they told him what they had seen; who, astonished at the relation, took one of the maids with him to a burgomaster at Dort, who immediately sent a spy to ascertain the truth of the story. Finding the report correct, he began to prepare for safety, and instantly sent to the States, who ordered soldiers into the city, and commanded the river to be let in by a certain sluice, which would instantly lay that part of the country under water where the besiegers lay in ambush. This was forthwith done, and a great number of the Spaniards were drowned; the rest, being disappointed in their design, escaped, and the town was thus providentially saved. The States, to commemorate the memory of the merry milkmaids' good service to the country, ordered the farmer a large revenue as a recompense to him for the loss of his house, land, and cattle; and caused the coin of the city to have a milkmaid, milking a cow, to be engraven thereon, which is to be seen at this day upon the Dort dollars, stivers, and doights; and similar figures were also set up on the watergate of Dort: and the milkmaid was allowed for her own life, and her heirs for ever, a very handsome annuity.—[Edinburgh Quarterly Journal of Agriculture.]

MANNER OF MAKING PERSONS FREE AT ALNWICK, IN NORTHUMBERLAND.—Those who are to be made free, or, as the phrase is, *leap the well*, assemble in the market-place, very early in the morning, on the 25th of April, being St. Mark's day. They appear on horseback, dressed in white, with white nightcaps, and every man a sword by his side, attended by the four chamberlains, and the castle-bailiff, mounted and armed in the same manner. They then proceed, with music playing before them, to a large dirty pool, called Freeman's-Well, where they dismount, draw up in a body, then rush in all at once, and scramble through the mud as well as they can. After this they take a dram, put on dry clothes, remount their horses, gallop round the confines of the district, and then re-enter the town, sword in hand, and are met by women, dressed in ribands, with bells and garlands, dancing and singing. These are called Timber-wastes. On this day, the houses of the new freemen are distinguished by a holly-bush, as a signal for their friends to come and make merry with them on their return. This manner of making free is peculiar to Alnwick, according to a clause in the charter given them by King John, who, travelling this way, stuck fast in a hole, and thus punished the town, for neglecting to mend the roads.—[Ib.]

ELECTRICITY.

Dr. Smith—Dear Sir,—You have my grateful acknowledgments for an interesting number of your Scientific Tracts. I regret to learn that you were disappointed in the trial of some experiments which I communicated to you concerning the motion of camphor on the surface of liquids. I have repeated them several times with the same results.

Will you accept a few observations from my journal (of 1830) on the subject of Electricity.

Penetrability of Electric Light.

If a piece of sugar, a potato, or an

egg, be included in the circuit of a Leyden jar, whenever a discharge takes place, a beautiful illumination is produced. A decanter of water, or the finger, may be strongly illuminated by the light from a battery or large jar. But by far the most brilliant illumination which I have ever seen from the electric light, may be produced by passing simply the spark from the prime conductor through the dried pith of corn-stalk. A sound piece of corn-stalk should be selected, the pith carefully cut out and thoroughly dried, and it is fit for use. The length of the piece of pith should be the same as that of a spark taken from the ball of the conductor. Whenever a spark is passed through the pith, a perfect, intense yellow light pervades its whole substance. Frequently red and yellow lights are produced together, and sometimes violet. This experiment will richly repay any operator for his trouble. It must be recollected, that unless the pith be thoroughly dried, the illumination will not be produced, as the electricity will pass by conduction.

Electrical Property of Copal.

I have frequently observed, while polishing pieces of copal, containing insects, that it became strongly electrical, and have been induced by this to make further trial of its value as an electric. The best form of this substance for experiment I found to be the dried copal varnish. On varnishing a large glass rod, and rubbing it with a piece of amalgamated silk, the quantity of electricity developed was immense, far exceeding that produced by the unvarnished glass. I then varnished the cylinder of my electrical machine, and the result surpassed my expectations. The machine furnished treble its usual quantity of electricity, and this continued for some months, when it began to abate its action. I found the varnish had become scratched by the crystallized portions of amalgam, and was obliged to scrape the varnish entirely from the cylinder. It remains, then, for some one to point out a method by which the friction of the rubber and cylinder may be diminished, with the pressure remaining the same, to make this improvement complete.

If you think these facts are worthy of a place in your Tracts, you may embody them in whatever form you please.

Yours truly,

CHARLES G. PAGE.

Salem, September 26, 1835.

I send you, Mr. Cultivator, the first of a series of "*Letters from a Father to a Son*," and intend to send you others, should this be thought worthy of a place in your paper, as leisure may permit, or inclination prompt.

PRELIMINARY.

Dear Son,—At no time in life do we stand more in need of parental counsels, or are more likely to be benefitted by them, than at the period when we are throwing off the boy, and are about to assume the cares and responsibilities of manhood. Youth are accustomed to look only upon the bright side of the picture; their anticipations are sanguine; their hopes ardent; and they need to be brought often to consider the sober realities of life, to check their unreasonable aspirations. They see not the sands and breakers which begird the ways of life, and upon which very many are early shipwrecked. They need the experienced pilot. Having served in this capacity for a score or two of years, in the school of experience, where all *may* learn, though all *do not* learn to profit, and being deeply interested in your future welfare, I propose to make over, for your use, some of the lessons which I have been taught in the school where yet you are but a noviciate. They constitute capital, if put to good use, and will be sure to make good returns, in the multiplied enjoyments of life. These will be given as they occur, without regard to arrangement.

Learn early to depend on yourself. Your physical and intellectual powers must be your main dependence for fame and fortune. The ground has been fitted for the seed. Your hands have been taught to labor; your mind to reflect. You must be the husbandman: you must sow the seed and nurture the plants; and the reward of the harvest will depend upon your personal diligence and good management. If you sow tares you cannot reap wheat; if you sow idleness you *will* reap poverty; for however abundant the parental bequest, few can retain wealth who have never been accustomed to earn it.

Beware of extremes—the *two* often meet; and by following the one too far, we often insensibly slide into the other. Thus prudence may run into parsimony; patriotism into peculation; self-respect into pride; and temperance in our habits into intemperance in our partialities, prejudices and passions. While you claim and exercise, as the high prerogatives of a freeman, the free expression of your political and religious opinions, and the right of disposing of your time and property in any way, that shall not infringe upon the rights of others, nor compromit the peace and good order of society, forget not to respect the same rights in your neighbor, whom education or association may have imbued with opinions differing from your own. Reform others by your example: for you can never make a sincere proselyte, in religion, politics or morals, or even in the arts of labor, by *coercion*. You may compel men to become hypocrites, sycophants, and servile imitators, but you do it at the expense of the best feelings that dignify our nature—at the expense of piety, patriotism and self-respect. Be moderate in all things—in your pleasures as well as in your toils—in your opinions and in your passions. Past experience should teach you, that your opinions may honestly change; and however long you may have cherished wrong ones, or obstinately defended them, to renounce error, when palpable, will reflect lustre upon your character. As it is human to err, so it is magnanimous to confess and renounce one's faults.

Intermeddle not officiously in the affairs of others. Your own concerns will demand all your care. Those who busy themselves with other people's business, seldom do justice to their own. Seek for enjoyments in the domestic circle, and make home agreeable to all around you. This is your duty as well as interest. Seek rather to be good than great; for few *can* be great, though all *may be* good; and count the approbation of your own conscience, above the applause of the multitude. Act in secret as you would in public—as though your motives were scanned by those around you — and you will seldom do wrong. Adieu.—[Cultivator.]

SUMMARY.

☞ As it is sometimes desirable to measure coal and grain in bins, as also the size necessary for cisterns of certain quantities, we give the fol owing, which will be found convenient, and sufficiently accurate for practical purposes. *One cubic foot and a quarter make a bushel.*—[Mechanic and Farmer.

Dr. Comstock, of Lebanon, Ct. in a letter to the editor of the Boston Medical and Surgical Journal, says, that there is not in the whole Materia Medica, a more *significant* remedy for the Cancer, than the juice of the cranberry, *Oxycoccus vulgaris*, made into an ointment with sulphate of iron, finely pulverized.

It is estimated by well informed persons, that no less than 19,000,000,000 silk worms die annually, victims to the production of the amount of silk consumed in England for one year.

Hooshier Oats.—There is now in the office of this paper a stool of oats; it has 12 stalks and heads, one of the heads, which we selected as a fair average contains 270 grains, making in all 3240 grains. The stalks measure 12 inches in circumference, six feet and a half in height. They were raised by Mr. Garret Seymour, who is lately from the Old Dominion, (Virginia,) and however its soil is noted for the production of great men, he says the Hooshier State far outstrips it in the production of oats. We think few countries can equal this production; the increase is 3,240 fold. Mr. Seymour would without doubt, have taken the premium of our Agricultural Society, but unfortunately the Society was vetoed not long since.—[Indiana paper.]

Large Apples.—We have seen accounts from different sections of the country of apples of uncommon size and weight. The largest that we now remember to have seen mentioned, weighed 24 ounces. Our own county of Franklin exceeds any thing that we have heard of in the growth of the apple. We have seen an apple which grew on the farm of Harrison Blanton, Esq. in this neighborhood, which, when pulled from the tree, weighed twenty-six ounces. The fruit is of the pippin kind, and is fair to the eye and delicious to the taste. The apples on the tree from which this one was taken, would average more than a pound in weight, and we are told that a lady in town, from four of them only, made a dessert which was sufficient for the entertainment of 17 persons. The crop of apples throughout the State is generally unusually fine, and we do not believe that the apple any where grows to greater perfection than it does in Kentucky.—[Frankford, Ky. paper.]

Mr. N. Manchester, of Plainfield, N. H., raised the past season five red beets, whose aggregate weight was 46¼ lbs.

Flax in Ireland.—Seven years ago, the value of flax grown in the north of Ireland, was little more than £50,000, annual value. In 1834, it amounted to £700,000 sterling. The present year, the quantity is expected to be doubled. Improved mills, for spinning by machinery, are rapidly increasing.—[Journal of American Institute. October, 1835.]

Mortality of Silkworms.—It is calculated that fourteen billions of silkworms, die victims to the production of silk, consumed in England in one year.—[Ibid.]

Silk.—Where, fifty years ago, eight bales of cotton were produced, one million two hundred thousand are now produced: It is predicted that, in a few years, as great an

amount of silk will be raised. Why not? —[Ibid.]

Chinese Mulberry Seed.—Quantities of these seed have been imported from China, and have failed of coming up. It is believed, through jealousy, they have been purposely subjected to a process, which, without affecting their appearance, has destroyed the fructifying principle.—[Ibid.]

Champaigne Wine.—It is said, a good article has been made at Trenton, N. J., which was passed off on some of our first tasters, for genuine imported.—[Ibid.]

Hops.—Messrs. D. & H., farmers on Connecticut River, Vermont, in 1833, from four acres, obtained 3000 lbs., which sold for 20 cents per lb. In 1834, from five acres and a half, they obtained 4000 lbs., which sold for 15 cents per lb. They calculated their crop for 1833, neat $100 per acre.—[Ibid.]

Anthracite Ashes.—The Philadelphia U. S. Gazette says, a lot of land, clay and sand, was made to produce most luxuriant clover, from being covered with these ashes. By some new process of igniting, the fine anthracite coal, which has been considered of little or no value, is rendered, for many purposes, quite as valuable as any.—[Ibid.]

Cotton Seed used for Food.—This is stated, from good authority, to be the fact in the southern part of Europe —[Ibid.]

Teasels.—This, at present, is one of the most profitable crops. There is a crop to be gathered this fall, on three or four acres of what was Mr. Cogswell's garden, said, by competent judges, to be worth $3000. We are told that many farmers in Hatfield have gone into the cultivation of it. The scarcity of the article is the cause of its present high price. A few years since, they were so low as to be hardly worth raising. The probability is there will soon be an abundance to supply the market.—[Ibid.]

Wheat Crops.—It is stated, on good authority, that crops of wheat of 47, 48, and even 52 bushels per acre, have been raised on the Genesee Flats this season. Machines for cradling, moved by horse power, are used on these smooth lands, one of which, by the aid of a pair of horses, will cut from twelve to fifteen acres per day, and place it on the ground in proper quanties for a sheaf.—[Ibid]

Massachusetts Silk Company.—An association of gentlemen of this city and vicinity has been formed, for the purpose of producing and manufacturing silk. The New-England Farmer states that the capital stock of this Company is $100,000, and that they have purchased a large tract of land in Farmingham, 20 miles from this city, on the Worcester Railroad, and that they have 200,000 trees of the white mulberry, and from 10 to 20,000 of the Morus Multicaulis trees, which are to be immediately set out. They have made a selection of an unrivalled location, and there is every reason to believe that the silk business, under the direction of the gentlemen interested, will succeed, and be a source of profit to themselves, and a great benefit to the country. A plantation of 150 acres of white mulberry trees, at 6 years of age, will produce from 20 to 25,000 lbs. of raw silk annually, which, at $4 per lb., will amount to the enormous sum of $100,000.—[Boston Courier.]

Silk.—The Editor of the Buffalo Whig acknowledges the receipt of a skein of silk, manufactured by Mrs. Reed, of Aurora, Erie county. It was from a crop of silk raised there this season, by Mrs. R. It is pronounced to be of superior quality, and equal to that which is found in our shops and stores.—[Genesee Farmer.]

A New Variety of Pea.—The Charleston Courier states, that a quantity of a new species of pea has been imported from Cuba, by Dr. B. B. Strobel, of that city, and placed in the publication office of the Southern Agriculturist, for gratuitous distribution, with a view of introducing their culture into the United States. It is a native of Old Spain, and is called the *Gareanza* or *Braganza.* Peas of this kind yield, in Old Spain, 300 bushels to the acre; they sell, ripe, in Havana market, for $1 to $1.50 per bushel. They are excellent for soups, are larger than even the marrowfats, and are said to be better, cooked in the same way.—[Middletown Sentinel.]

Great Crop of Cushing Pears.—The original tree of this valuable variety, produced, this season, on the farm of its owner, (Col. Washington Cushing, Hingham,) *eighteen* bushels of Pears. In our report of the market, for the month of September, they were selling at seventy-five cents per half peck. If they were all disposed of, at this price, they produced the sum of $104.—[Amer. Gar. Mag.

Ice.—The Pacha of Egypt has contracted to be supplied with ice from Boston. The Government of Malta has also a similar contract; the ice to be furnished at 4 cents a pound.—[Genesee Farmer.]

Barley.—The barley crop of the town of Pompey, is estimated to have yielded the farmers of that town, this season, more than $60,000.—[Onondaga Standard.]

Native Almonds.—Nearly a peck of almonds has been raised this year, from a limb grafted on a peach tree, by Mr. Ira Stimpson, near Rochester, N. Y.—[Sat. Evening Visitor.]

Mulberry Turnips.—A correspondent of the Journal of Commerce, writing from New-England, says, sundry of the farmers there have sown mulberry seed, for which they paid the Chinese fifty dollars a pound, and on its coming up, have found it to produce nothing but *turnips!* Say no more of the bass wood pumpkin seeds.—[Vermonter.]

Little Delaware against the World for Apples.—The State Journal gives the measurement of 6 apples, raised at Brandywine, whose aggregate weight was 7 lbs. 5 oz., circumference 7 feet 2 inches. The largest weighed 21 oz., and measured 15 inches in circumference.—[Ibid.]

Dahlia, or *Georgiana,*—Is a native of Mexico, and is one of the most splendid of all the flowering plants. It is cultivated extensively in every part of Europe, not only amongst the wealthy, but has become a favorite with the florist, in filling up a chasm at that period, when most other flowers are over. Its innumerable varieties of form and color, are not equalled in any other genus of plants; and its spreading so rapidly through the country, is sufficient proof of the superiority of the flower. As the rose has always been ranked as "the Queen of Flowers," the dahlia may claim the title of the "King of Flowers.—[Journal of the American Institute.]

A good Yield.—The Kentucky Gazette says, that Capt. Joshua E. Treadwell informs us, that he dug, a few days since, *two hundred and thirty-one* potatoes—measuring three pecks—the produce of a single potato, planted last spring.—[Yankee Farmer.]

The Grain Worm has reached as far west as Minden, between 50 and 60 miles west of Albany. A farmer residing there informed us, that there were some of the worms in his wheat, and that seven miles east of him, they had destroyed half the crop.—[Cultivator.]

A young mechanic of Woburn, Mass., has invented a machine to peg boots by water. The machine is a very neat piece of work, and is said, by good judges, to be a superior invention.

Mammoth Radish.—A few days since, we were shown a radish, which grew in the garden of Mr. Warner D. Shaw, of Fluvanna, which measured 21 inches in circumference, and weighed some ounces over 20 lbs. We presume this is the largest radish Chatauque has produced.—[Jamestown Journal.]

A new species of wheat has lately been discovered in France, which ripens in 70 days. The farmers state, that it affords 3 harvests annually, and will grow equally well in all seasons!!—[Oswego Observer.]

A Boston paper announces the arrival, in that city, of a couple of waggons from Connecticut, loaded with *seventy thousand mulberry trees,* for the Massachusetts Silk Company's farm, at Farmingham.—[Wayne Sentinel.]

Potatoes. — Our neighbor, Mr. Mead, planted, last spring, a quantity of potatoes, of one kind, and in the same soil. In the latter part of July, he cut off the tops of about half of them. In digging them, he finds that in those hills where the tops were cut, the potatoes are twice as large as those where the tops were permitted to grow, and much more numerous—a fact for the agriculturist, which may prove of utility.—[Barre Gazette.]

Mammoth Apple Tree.—The Romney (Va.) Intelligencer states, says the Genesee Farmer, that there is an apple tree, growing on the farm of Capt. Daniel McNeill, of that county, the dimensions of which are as follows: Height, by careful and accurate measurement, 45 feet; width, 85 feet; circumference of the trunk, 9 feet 4 inches; about 7 feet from the root, there are 11 branches, the average size of which is 3 feet 10 inches. This remarkable tree bore, the past season, nearly two hundred bushels of large sized apples. What is very singular of this tree is, that it never bore any fruit until after twenty years of age. It grew spontaneously where it now stands, and, though forty years old, it still continues to grow.

A Radish.—The Olentaugy (Ohio) Gazette states, that a radish was brought to that office, by Capt. C. Plumb, of Berkshire, which excels any other instance of extraordinary vegetable production on record. It measured two and a half feet in circumference, two feet in length, and weighed twenty-one pounds!—[Albany D. Advertiser.]

The Porking Emporium.—The N. Y. Courier says, that one hundred and fifty-two thousand hogs were slaughtered, last year, at Cincinnati; and the papers of that city say, the number will be much larger this year. The value of the pork exported the past year, was no less than two millions of dollars!—[Ibid.]

[*From No. 6, of "The Silkworm."*]

THE SILK BUSINESS.

As a great national object, the silk business is no longer an experiment, as respects this country. In itself, its practicability, its intrinsic importance to community, and its immense value, as an item of national wealth, have been fully tested, and the practical knowledge and skill required for its management, have been matured by the experience and ingenuity of ages. But in this country, as we knew nothing of the subject except by its produce, brought from foreign countries, we had only to wait and see whether the spirit of the public could be sufficiently awakened to its importance, to engage in the production of the raw material, and whether, if we could obtain the skill, we could enlist the necessary capital to engage in manufacturing it with any degree of success. Both these points are now so far settled as to leave no room for doubt.

As I have stated at the beginning of the first number, the attention of both men and women throughout the country, seems to be wide awake to the subject. It was thought, not long since, by Mr. D'Homergue and some other gentlemen of talents, that it would be long before we could successfully engage in manufacturing silk, and particularly because it was that men possessing the necessary capital, would not be willing to hazard it in a business which they would consider precarious. But this difficulty has vanished, and funds equal to the utmost requirements, are now seeking a chance to be invested. We have among us no want of skilful hands, bred to every part of the business, and anxiously seeking employment. We have native citizens who have already made some important improvements in the plans of operation, pursued in the best ancient establishments, and more, many more, will undoubtedly be made. Judging from the present state of things—from the enthusiasm with which the public have already taken hold of the business—from the activity and energy which are inseparable from a state of civil liberty, where every one is free to follow any honest pursuit he pleases, and where useful talent is sure to meet a reward, we may safely conclude that the day is not far distant, when we shall not only hold a respectable rank, as a silk-growing and manufacturing nation, but when our improvements in taste, and facilities of execution, will mark a new era in the business.

There probably never was an instance before, in which a nation containing 13 or 14 millions of people, and scattered over 2 millions square miles of territory, were all seemingly at the same moment inspired with an enthusiastic ardor to engage in one and the same enterprise, and that calculated to produce the most happy results of any that human wisdom could select. Such, however, is the case in the United States at this time, with respect to the cultivation of silk. It seems to be the all-engrossing topic of conversation, and scarcely a newspaper throughout the nation is silent on the subject. Even the contentions of political opposition seem to lose somewhat of their asperity, and party spirit itself to be influenced by the softness of silk.

It was my intention, as I have before stated, to fill the pages of the "Silkworm" principally with original matter, and it is so still; but besides valuable communications from correspondents, the newspapers from every quarter teem with articles on the subject, some of which are replete with too much good sense to be overlooked.

The following items were extracted from a communication from Mr. Nathaniel G. M. Senter, of Kentucky, to the Editor of the Tennessee Farmer. They not only show how generally the silk spirit is diffused through every quarter, but they contain valuable information. Mr. S. says,

Friend Emmerson,—It is with pleasure I acknowledge the receipt of your five numbers of the Tennessee Farmer.

The first article which caught my eye, was an article on the culture of silk, and a letter from Judge Spencer, to his friend Samuel Hopkins. I am, indeed, highly delighted to observe that the culture of silk is attracting the attention of the sagacious mechanic, the talented, the enterprising projector, and the public spirited philosopher. I have ever admired the ingenuity and delighted in the society of the industrious insect, which, with so much adroitness and perseverance, converts the mulberry leaf into the rich and golden cocoon. Curiosity led me, three years since, to visit the Shaker Village, on Whitewater, State of Ohio; and in May I first saw the operations of this peaceful and industrious little creature. Under the control and care of one of those innocent daughters of religion and love, I saw, to my utter astonishment, the daily conversion of the raw material, taken from the forest, into the glossy and beautiful fabrick, in which queens are apparelled and princes robed.———

——— In a letter recently received from that active, generous, and highly esteemed fellow citizen, Nicholas Longworth, *Cincinnati*, he observes, "I am entirely satisfied that the culture of silk will spread itself with great rapidity over our beloved land, and that the labors of cultivating the various kinds of mulberry trees, and rearing the worm and reeling the silk, will be much abridged by the active and intelligent faculties of citizens of the United States." How completely has one part of this prediction been verified, in the late inventions of the ingenious Gay and Mosely.

When such men as D'Homergue, Duponceau, Mease, of Philadelphia; Longworth, of Cincinnati; and Gideon B. Smith, of Baltimore, appear to be active in its promotion, what can be expected but that the mighty tide will turn, and that the silk interest will share largely in the attention, and participate proudly in the triumphs which American zeal and skill will effect in our land.———

——— Depend on it, Friend Emmerson, ten years will place these interests on a level with those of cotton, rice, and grain. Our countrymen possess unbounded energies,—strong, nervous, and almost insensible of depression; the native sons of our soil accomplish any thing within the reach of ingenuity or intellect. There is no branch of business, [throwing aside all views of profit,] carried on in society, which is attended with so many charms, and so few toils and exposures, as the raising of silk-worms. Except the gathering of the leaves, every part of the process is conducted under cover, from heat and rain; hence, delicate females, boys, and aged people, can work to as much advantage as the healthy and robust. The peaceable disposition evinced by these sagacious little insects, is not the least of their virtues. They seem incapable of imitation, but every one pursues his labors with an equanimity and zeal, even surpassing the industrious bee. The Shakers have raised silk and manufactured it for twenty years.———

——— I have made several remarks on this, my favorite pursuit; now permit me, Friend Emmerson, to detail to you facts within actual observation.

Mr. Daniel Rowe, an ingenious and enterprising citizen of Dayton, Ohio, about three years since, occupied three large rooms in the city with worms. He had never, before that season, paid any attention to them, or the culture of the mulberry tree. He hired a man and boy to go to the forest, two miles

from Dayton, and gather leaves. Two girls were employed five weeks in feeding them, and preserving the cocoons. He was indebted wholly to the woods for their food. About the same time, he set out five acres of trees; some white and some red mulberry, from the woods. Two years after this I received information, in a letter from Nicholas Longworth, of Cincinnati, that a factory was established in Dayton, and that vests and handkerckiefs were manufactured with success, and, much to his honor, to the delight of the citizens. The five acres of mulberries, according to all concurrent statements, particularly to the one made in April 1835, by Judge Spencer, ought to yield him $1500 clear gain.———

——— Another fact, which I have made public, in a lecture, which I gave on the subject of the silk culture. Two log cabins, at the Shaker Village, in Ohio, and a garden house, were appropriated as nurseries for the worms. The leaves were brought half a mile by boys, and the worms fed and cleaned by two girls of thirteen years old, superintended by a young and beautiful Shakeress, somewhat acquainted with the business. In five weeks, the cocoons were exposed to the sun, and reeled into raw silk, and sold to Daniel Gano, of Cincinnati, I think, for $97 50.———

——— The Valentine Silk Company, of Providence, Rhode Island, have 30,000 trees on their farm, each tree yielding, on an average, one half pound of silk, worth, at least, $5 per pound, making their increase worth $75,000 per annum, powerful machinery in operation, to weave the material, and elegant stuffs have already been produced.———

——— *The Eton Register* says,—Mrs. Alford, of Newcum, Preble county, Ohio, has the present season, with the aid of one small girl and two boys, about twelve years old, fed and attended about 50,000 worms, with the leaves of the common mulberry tree. From her labors of six weeks, she realized $225 from the sale of the raw material. The [same] raw material, when put into skeins, would bring $400. The silk she manufactured is equal in elegance and richness to any foreign silk; and yet this female accomplished all her labors without the aid of theory or instruction.———

——— The Dayton Journal of 1831 says, "a citizen of our vicinity, with the aid of two boys, has attended 100,000 silkworms, which produced 300 pounds cocoons, which sold in Philadelphia for $125."———

——— The Cincinnati Chronicle says, Mrs. Daniel Parker, of Clermont county, has been active in introducing the mulberry tree into the Miami valley. She raised, from 50,000 worms, $180 worth of silk, with the assistance of her two little daughters. She is preparing to extend her operations, and devote her time and talents to this business.———

——— The Cincinnati American says,—Mr. James Smith, of Bladen county, North Carolina, made 100 pounds of fine sewing silk from 200,000 worms, which sold for $700. Four or five negro children attended them under his instruction. These are a few of the countless facts respecting the productiveness of the silkworm.

No man delights more in being engaged in the business than myself, and can wish the cause greater prosperity. If you think these remarks worthy a place in the Tennessee Farmer, you can give them an insertion.

NATH. G. M. SENTER.

I have selected the above extracts from the excellent communication of Mr. S., not because the whole was not worthy of a place, but because the remainder of the paper was already appropriated to other matter.

[From the Silk Culturist.]

Albany, August 27th, 1835.

SIR,—In your July No. I saw a communication from a silk culturist, asking for information respecting the Black Ant. I have had some experience respecting the encroachments of that insect, and can give you my experience in a few words. I was troubled very much this season with the ants: they destroyed some thousands of silkworms for me. I tried various remedies as recommended to me to destroy them, without effect, till at length I tried lemon juice. I placed it about my shelves and cracks where they came out. That had the desired effect for that time—but as they troubled me no more during the lives of the worms, I expected they were vanquished; but in that I was disappointed—they seemed to have waged a war of extermination—for they came out with great fury, and attacked my seed millers, and killed some hundreds before I discovered them; but applying the lemon juice again it dispersed them, and I had no more trouble with them. Therefore I would recommend lemon juice to our friends in preference to any thing else.

Yours respectfully,

GEORGE W. PAUL.

VARIETIES IN SILKWORMS.

The questions are frequently asked, whether there are not different breeds or varieties of the silkworm? If there are, what are their peculiarities, and what is the description of each? If they differ in value, which is to be preferred? Cannot two or more crops of worms and of silk be raised in a season, and what will be the advantages, and what the objections?

These questions naturally suggest themselves to the mind of any person, engaged or engaging in the silk business, and who posseases in any considerable degree a spirit of inquiry. I will, therefore, present the best information I possess on the subject. Count Dandolo has probably acquired and imparted to the world more extensive knowledge connected with the silk business than any other person; and the late Secretary of the Treasury of the United States, in his report to Congress on silk, has gathered from him, and from other sources, all the information he could obtain on the subject, and among other things on the points above alluded to.

It is true, this part of the subject may not be in the highest degree interesting to the frugal silk grower, who has more economy than curiosity; but there are others who wish to reconnoitre the whole ground; and they have an equal claim to be gratified. The following statement is from Mr. Rush's report.

VARIETIES IN SILKWORMS.

Silkworms of three casts or moultings.

I have reared, says Dandolo, a quantity of these silkworms separately, the eggs of which may be found in several parts of Lombardy. The worms and cocoons of this variety are two-fifths smaller than those of the common sort. His experience demonstrated that these worms consume, to form a pound of cocoons, nearly as much leaves as the large species, and although smaller, when they reach their full growth, they devour more fragments and shoots of leaves than the common sort. Their cocoons are composed of finer and more beautiful silk than the common cocoon. They are altogether better constructed, and to this is owing the greater quantity of silk, which at equal weights, is drawn from these cocoons, than from the common cocoons. This variety, in the opinion of Dandolo, should be infinitely more cultivated than it has hitherto been; for,

1, These silkworms require four days less of care than the common silkworms.

2, They afford a saving of time, labor, and money.

3, They are not so long exposed to accidents—their life being shorter.

Some imagine the species to be delicate, but they appeared to Dandolo to be strong and vigorous. Six hundred cocoons weigh a pound and a half.

2. *Of large Silkworms of four casts.*

Dandolo reared many of these silkworms of a very large quality. The eggs came from Friuly; they produce large worms and large cocoons, yet they, [the eggs,] are not *much* larger nor *much* heavier than the eggs of the common species. The worms at their full size weigh nearly twice and a half as much as the common worm. The cocoons are in the same proportion, 150 of the large sort weigh a pound and a half, while it requires 369 of the common cocoons to weigh as much. The silk is coarser, and not so pure as that of the common kind; the worms are five or six days later in attaining their full growth and in raising than the common silkworm.

3. *Of the worms that produce white silk.*

"I have raised," says Dandolo, "a large quantity of these, and found them in all respects equal to the common silkworms of four casts. If I reared silkworms for the purpose of spinning the silk myself, I would cultivate only the silkworm of three casts, and those that produce white silk, as preferable to all others; and every year would choose the very whitest and finest cocoons, to prevent the degeneration of the species."

"This species was introduced into France about forty-five years since, from China, but was not much cultivated until about seventeen years past. It is now highly prized by the manufacturers, as appears by the report of the exhibition of French industry until the year 1819."

"In Windham county, Connecticut, there is also a small, pale, white worm, which eats but twenty days, and produces fine white silk, though in less quantity than either the common large, pale, white, or the dark colored worm: but it has the good quality of retaining its clear white color, and does not turn yellow by washing, or by exposure to sun and air. These worms produce also two crops. It is highly probable that these white worms are of the same species as that last mentioned."

The same report proceeds with a paragraph respecting silkworms of eight crops, but I think it contains little matter which could be of any use to the practical silk grower. There are varieties in the same species as well in animal, as in vegetable life, and as likely to be exhibited in silkworms as in any other species of insect; and it is very probable that could the world be searched, a breed, or perhaps more than one, could be found, in some points, or all, preferable to those now raised in the country, and the more especially, as there appears some essential difference in different breeds now among us. But I should think it bad policy for people who engage in the silk business, for the sake of immediate profit, to incur great expense, or neglect the breeds of worms they now possess, in the hope of finding better breeds in some other quarter of the globe. There are doubtless persons in the country, possessing wealth and enterprise, who as amatuers in the business will make sufficient search for those improvements, and they will have means to obtain the necessary information where to search.

I have no doubt but that in the southern, and even in the middle section of the United States, it may be profitable to raise two crops of silk in a season; and it may also be so in the northern states, in large establishments, where they are furnished with an entire apparatus for regulating the heat and moisture, such as every large establishment ought to, and no doubt will possess. But in the domestic department of the silk growing business, in which I sincerely hope and firmly trust far the greatest part of the business will forever be conducted; and especially in the northern states, I should think it much the most advisable to be content with one crop in the season, at least until experience has rendered the business somewhat familiar, and until they can judge for themselves from the past, how to proceed in future.

[From the Silk Culturist.]

DETERIORATION OF SILKWORMS.

A superstitious notion formerly prevailed to a considerable extent, that the eggs of the silkworm must be changed every two or three years, to prevent the deterioration of the worm. This notion, like many others of the same class, is at war with reason and science. The supposition that good cocoons, after a few years, are no longer fit to produce good seed, is ridiculously absurd. The time has gone by when the idle and foolish theories of Buffon, Robertson, De Pauw and others, respecting the tendency of nature "to belittle," and degenerate every thing in the new world, are received as truths. Facts also have settled the question that the silkworm will not degenerate, except as a consequence of neglect, or the long propogation of those of a diminutive size.

MORUS MULTICAULIS.

It has been a question involving deep interest in the minds o persons engaged, or intending to be engaged, in the silk business, whether they could or could not safely rely on realizing the benefit of this wonderful plant—whether it would survive the severity of our winters, and regularly yield its amazing tribute of nutricious food to the silkworm, or whether it was to be considered merely as forbidden fruit, calculated to excite wishes it could not gratify. When I commenced the "Silkworm," the information I had been able to gather, rendered the case doubtful, but not desperate. Besides its liability to be killed by frost, another difficulty has presented itself. The seed which had been obtained with much care, to procure that which was genuine, and sowed and attended as a choice article, has in some instances proved to be degenerate; but I think I can safely announce the cheering intelligence, that it may be confidently relied on, as calculated in a short time to supercede the white mulberry altogether.

During the present and last year's season, it has obtained the attention of horticulturists, perhaps more than any other vegetable; and the result of experience is now almost daily received, which proves beyond any reasonable doubt, that in the first place, it will bear the winter as well as the white mulberry, and indeed as well as most other fruit trees. But this caution, it is found, will always be necessary—the young trees grow with more rapidity than perhaps those of any other fruit tree, and consequently, when frost commences, a portion of the season's growth is not converted to hard wood; but is soft and full of juice, and of course, especially from young roots, will not be able to resist the winter's frost, when very severe. Mr. Cruttenden, of the Eagle Tavern in this city, has a number of the plants in his garden, mixed with white mulberry and other fruit trees. Most of the young trees were injured by the frost last winter, and some entirely killed; and among others, those of the morus multicaulis, which I believe were two years old,

were killed down to the ground; but they sprouted up most luxuriantly in the spring, and are now from four to seven or eight feet high, bending almost to the ground, where they have room, with the weight of their foliage. The ends of the branches of his white mulberries, in the same situation, were killed to the hard wood. It will be readily seen that the soft green shoots which have grown so rapidly, will be unable to withstand such attacks of frost as they were exposed to last winter; but when hardened to the ligneous state, they may be considered out of danger. It is therefore necessary that they commence their growth as early as 'possible, in order that they may get well rooted, and wooded some distance above the ground before winter; and in the fall to cut them off, a little above the ground, and down to the solid wood. It will also be seen that those young trees which grow in rich, moist earth, will be most likely to be killed, as their green shoots will be longer and more tender. Those in light, dry and elevated ground, and even in the most bleak exposures, have hitherto stood the best.

In the second place, it is now suspected by some skilful horticulturists, that the morus multicaulis is an aritficial variety, produced in China, through a succession of ages, and propagated only by transfer from the wood. When raised from the seed, it has been found to produce degenerate plants, and it has been thought probably would, in time, return to its primitive in the common white mulberry, or some other species: but this is no objection, as it is as easy to raise it from cuttings, grafts, or layers, as from the seed.

But whatever doubts might have remained respecting this most interesting plant, they may now be considered as fairly put at rest, by the statement of that distinguished horticulturist, Mr. Wm. Kenrick, of Newton, near Boston, in the catalogue of trees in his nursery. The whole community of both actual and anticipative silk growers, are certainly under a heavy debt of gratitude to Mr. Kenrick, for his zeal and energy in introducing the morus multicaulis. This catalogue concludes with an address under the head of "Silk and the Mulberry from China," which is so apropos to the subject, that I trust both Mr. K. and the public will pardon me for giving it entire, for I cannot select any part of it without injustice to the remainder.

SILK AND THE MULBERRY FROM CHINA.

Wherever the mulberry finds a congenial climate and soil, there also the silkworm will flourish. Such a climate and soil and such a country is ours, throughout the whole extent, from its eastern to its western shore.

The silkworms, and the plants whereon they most delight to feed, are the natives of China, a country famous, from antiquity, for its silk, and renowned for its industry; a parallel only to our own in its climate and diverse latitudes. These, the "*common white mulberry*," which is sometimes, though improperly, called the *Italian mulberry*, and the *morus multicaulis*, all being alike the natives of the same climate and country.

The morus multicaulis, also called, by way of excellence, the *Chinese mulberry*, is a tree of surpassing beauty; a new and most valuable variety for the nourishment of silkworms; a tree which is represented as possessing such decided superiority over all others, that it will speedily be substituted for them all, in every region of the globe.

The tree grows vigorous, upright, and beautiful; the leaves, in a dry and arid soil, are of less size and illiptical, their breadth being six inches, and their length eight; but in rich, friable, and humid soils, they are large and *cordiform*; extraordinary specimens have sometimes measured more than a foot in breadth, and fifteen inches in length. They are invariably curled or convex on the upper surface, of a deep and beautiful shining green; a plant of the easiest culture, by grafting, by innoculating, by layers, and by cuttings; but we are assured, by no other mode, as has been proved in France, in Lombardy, and in Venice, where the seed sown have produced varieties, but none like the *true kind*. By the modes above named, only, and by these exclusively, have the Chinese reared this tree from time immemorial, this being *a variety*.

By these characteristics is the true morus multicaulis distinguished, not only from the Dandolo mulberry, but also from another variety, which has been mistaken for this, and which I saw growing at Northampton, the seeds of which came from China. At first sight I concluded they were the Morettiena or Dandolo, a new species from Pavia, which, like these, has a large leaf, with a plain surface; but on examination I saw that they differed as much from this as they differ from the *true kind*.

It is sometimes called the Morus Culcallata, also the Perrottet mulberry, so called from M. Perrottet, Agricultural Botanist, and traveller of the marine and colonies of France, who has introduced this plant to Europe. It was first discovered by him at Manilla, the capital of the Phillippine Islands, whither it had been brought by the Chinese, as a tree of ornament, as well as of eminent usefulness. From Manilla, the morus multicaulis was first introduced, by M. Perrottet, to the Isle of Bourton, and finally it was brought by him to France in 1821, in that vast collection and variety of productions, which he had, during 34 months, procured from the seas of Asia, or gathered on the coast, or in the lands of Guiana.

At a later period, it was sent from Cayenne to Martinique, and from France to Gaudaloupe, also to Senegal. The numerous plants which are already disseminated in the divers climates of Africa, America, and Europe, have all been produced by the two individual plants, which were brought by Mr. Perrottet from Manilla.

The morus multicaulis differs from all others, in the uncommon vigor of its growth, and the facility with which it is propagated from layers, or even from cuttings; also, from the remarkable size which the thin, soft, and tender leaves speedily acquire, and the promptitude with which they are renewed. The fruit, which was unknown even in France till 1830, is long, black, and of appearance sufficiently beautiful; its flavor good, being intermediate between that of the red, and that of the black mulberry. The silk which the worms form, from the food afforded by this plant, is not only of superior quality, but the cocoons are of unusual size. The leaves, from their extraordinary dimensions, being gathered with important economy of labor, and of time, and from their superior nutricious qualities, they are preferred by the insects to all others.

This mulberry should be cultivated in hedge rows, and never suffered to rise higher than seven or eight feet. But a few years are sufficient, to raise considerable fields of them in full vigor, sufficient to support an immense number of silkworms; and regular plantations can be formed, by planting the trees at the distance of from six to eight feet asunder; or in rows ten feet asunder, and the trees at five feet distance in the row; a space sufficient for the extensions of the branches, sufficient also for cultivation, and for the greater convenience of gathering the leaves.—So greatly is this last operation facilitated by the flexibility of the stalks, and the superior size of the leaf, that, as we are assured by Mr. Perrottet, a child is sufficient for gathering the food, for a large establishment of silkworms.

The morus multicaulis, since its introduction into France,

seems destined to replace, every where, the common white mulberry, for the nourishment of silk worms; such is its decided superiority over all others.

The prediction of the late Dr. Pascalis, in 1830, that, "after the discovery of this plant, a doubt no longer exists, that two crops of silk may be produced in a simgle season." This prediction has since been accomplished—its truth fulfilled by experiment; the soil and cultivation—the habitations from the successive generations of silkworms, being yet the same, all thus converted to double use,—and the production of a twofold harvest,—it will be obvious that the actual profit, thus augmented, must be many fold.

SOIL, SITUATION, AND CLIMATE.

Although the mulberry flourishes most luxluiantly in a moist and rich soil, and protected situation, yet the leaves which are produced in such soils are more crude, and not of quality so nourishing. The growth of the tree in such soils and expositions, besides being more rapid, is prolonged to a later period in autumn, or until suddenly arrested by frost; and the immature wood of a forced growth being more tender, is consequently more liable to be killed by early frost and by winter. Such appears to have been the case in the winter of 1831-2—which destroyed so many full grown trees of the hardiest description, even to the root.—The ravages of that destructive winter, like that of our last, seem to have been confined to particular situations and soils, to the productions of the forced growth of a summer not less uncommon and extraordinary.

This mulberry braves the most rigorous winters of France. Of this important fact we have indisputable testimony even of the uncommonly severe winter of 1829–30. It has there been acclimated even to the extreme north, as far as Havre; and where it has been cultivated by M. Eyeres from its first introduction into that country.

We distinguish between trees and plants which grow in a state of nature, and those growing in a state of artificial cultivation. In a state of nature, and in the protection of the forest or of herbage, the growth of the young seedling tree, during the first year, is indeed slow, but the young plant finishes its growth for the year, and attains to a *ligneous* consistence, and the wood completely matures in due season. While in a state of cultivation, the growth is prolonged, and the wood immature, it meets the frost of autumn and of winter unprepared; and even the young seedling plants of the plumb and pear, the quince and the cherry, whose growth have been, by art, forced on, must be, in our climate, by art protected on a naked and defenceless soil. The same protection, during the first winter, is alike required to the young and tender seedling plants of the common white mulberry; and the young plants of the morus multicaulis, so valuable, the layers of a single summer's growth, which are separated in autumn.

Even some of the hardiest trees of the forest require protection, in our climate, during the first winter, in a state of cultivation so opposed to nature. They find not, in a highly cultivated and naked soil, that escentially necessary protection at the roots, which they always find in their own native forest. The danger, in this case, becomes four fold from these several causes combined.

The destruction to young and delicate trees and plants, which is sometimes occasioned by winter, is caused by the alternate freezing and thawing of the earth at its surface. The frost, by its expansive power, operating as a girdle, by compression, death assails, at the surface, and the top dies as a consequence. The bountiful covering of moss and herbage, or leaves, with which provident nature clothes the earth, being amply sufficient to modify the growth of the plant, and to defend it at the root.—This protection, like the fleecy snow, being two-fold, it defends alike from the sudden and excessive cold, also from the still more destructive and pernicious rays of the sun.

Since the introduction of the morus multicaulis to New-England, in 1831, this tree has had to contend, even in its very infancy, with two winters, such as were never before recorded in the memory of man, or in the annals of our country; winters doubly severe, and with augmented power to kill.

Yet, during the last winter, and when the thermometer had descended from 30 to 40 degrees below zero, and in various parts of New-England, and in situations the most bleak and exposed to cold winds, the morus multicaulis, the well-established plants of three or four years of age in suitable soils, have borne the trial, with power to withstand the defying storms, and the piercing cold, even of such a winter as this.

Others there might be, those of younger growth, and those, especially, which, late in autumn, had been transplanted to new positions, or the forced trees of but a single summer's growth, defenceless, unprotected, and all exposed, on an unsuitable and naked soil, which the winter overcame, causing them to suffer, even unto death, and to share the fate of those other trees, of other kinds and species, of a mature and hardy age, which this same winter had killed; and the full grown white mulberry trees, which, at Mansfield and elsewhere, this winter had destroyed.

The proper soils for the mulberry tree are dry, sandy, or stony; and trees growing on dry, sandy, or stony soil, and situated on the open plains, and on hills the most exposed to cold winds, will be found to suffer least of all from the destructive frosts of autumn and of winter. With all authors, I must agree in recommending a soil of but moderate fertility, and, least of all, a cold, moist, and heavy soil, or even a very rich soil. A dry soil, or a friable subsoil, on gentle elevations or declivities, being the most suitable of all for the mulberry from China.—[*From Kenrick's Catalogue.*]

[From the Silk Culturist.]

Suffield, August 24th, 1835.

Mr. Editor,—As the time is drawing nigh when it is convenient for many people to remove their trees, and as it is desirable to preserve them in a good and healthy state until spring, the question is so often asked as to the best method of doing it, I have thought that a few hints on the subject would not be amiss.

Small mulberry trees, intended to be removed the ensuing autumn, should be taken up soon after the fall of the leaf, and the roots carefully covered with sandy loam, or a hole may be dug in a sandy upland where it will not hold water, and a layer of trees and dirt alternately put in; and, when near the top, fill it with dirt, and raise a mound over it sufficient to shed the rains, and let them remain until it is time to set them out in the spring.

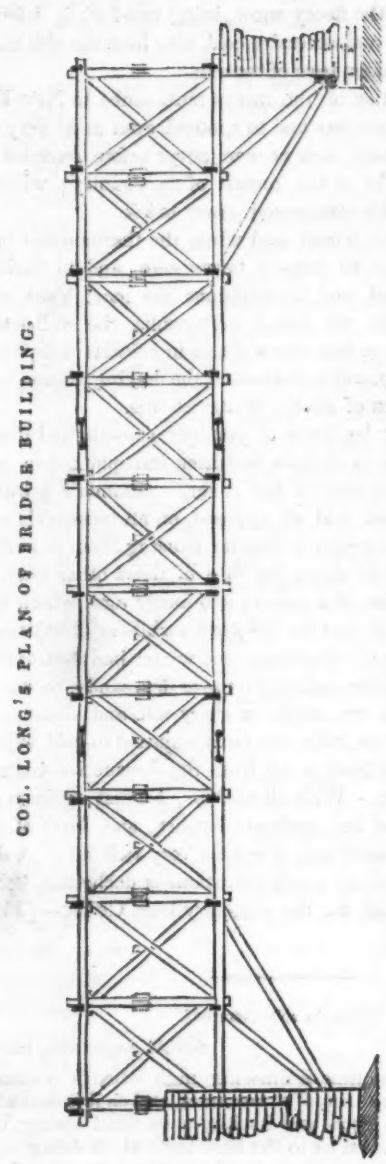
Trees may also be preserved good by putting them into a box, well packed in dirt, as above mentioned, and placed in the cellar. In all cases, care should be taken that the dirt comes in immediate contact with the roots; for, if they are crowded together without, they will be liable to heat and mould, and the future death of the tree will be the consequence.

Care also should be taken that the mice do not harbor amongst the roots, as they are excessively fond of them, and will ruin the trees; therefore, no straw ought to be used.

I have had experience in all of the above mentioned methods, which has been attended with success, and have also suffered from the same causes which I have warned others against.

Yours, &c.

THOMAS J. BESTOR.



COL. LONG'S PLAN OF BRIDGE BUILDING.

[From the American Railroad Journal.]

The annexed plan of, and certificates in relation to, Col. Long's Bridge, has been several months in our possession, and ought long since to have been laid before our readers. We publish a part of the certificates accompanying the drawing, which give an idea of the estimation in which the plan is held by practical men.

The undersigned, agent for Col. Long of the U. S. Engineers, offers to all persons interested in Bridges, as is believed, the most important and latest improvement which has yet been made in bridge-building.

The plan of building is such as to bring into profitable use timber of any length, and to build at any length of span from 20 feet to 300 feet between bearings.

Among the important advantages possessed by Col. Long's bridges over others, the following are believed to be peculiar to his:

All the strain on the important timbers is length wise; and this too without any material strain or thrust against the the abutments.

Any defects which time shall make, can be repaired with the same facility as the putting in of the original timber.

The work is so well secured as to admit of driving at any speed, with perfect safety, and without injury to the structure.

A great number of bridges built on this plan are already in use in the Eastern, Middle, and Western States; all of which have fully answered the most sanguine expectations of the Architects and Proprietors.

MOSES LONG.

The following selections are from the numerous recommendations of Col. Long's plan of bridge-building:

"*Baltimore and Susquehannah Railroad Office, January*, 1833.—Messrs. Hassard and Curley have constructed for this Company three bridges upon the plan of Col. Long, two of them about 70 feet in length, and the largest 100 feet. I am well acquainted with the different plans that have been adopted for the construction of wooden bridges, particularly Towne's and Burr's, which have been generally used in this part of the country, and I am satisfied Col. Long's plan is superior to any of them, in point of strength, solidity, permanency, and above all, in the facility with which it can be repaired, by replacing any piece of timber without disturbing the structure, so that by constant slight repairs the bridge will be perpetually renewed, at a very slight expense.

"These bridges have been passed more than five months, with a steam engine and tender weighing at least ten tons, with heavy trains of carriages attached, without causing the slightest perceptible motion of any kind in the bridges, which remain in the exact position they occupied when first erected.

"My opinion in respect to these bridges is sustained by the whole Board of Directors, amongst whom there are several gentlemen who possess much theoretical and practical knowledge on this subject."

(Signed)

GEO. WINCHESTER,
President.

"The bridges above mentioned were built in conformity to my directions, as also several others on other works under my charge, and I fully concur in the opinions expressed by the President of the Baltimore and Susquehannah Railroad Company, in favor of Col. Long's plan of bridge-building."

(Signed)

WM. G. McNEILL,
Captain Top. Engineers.

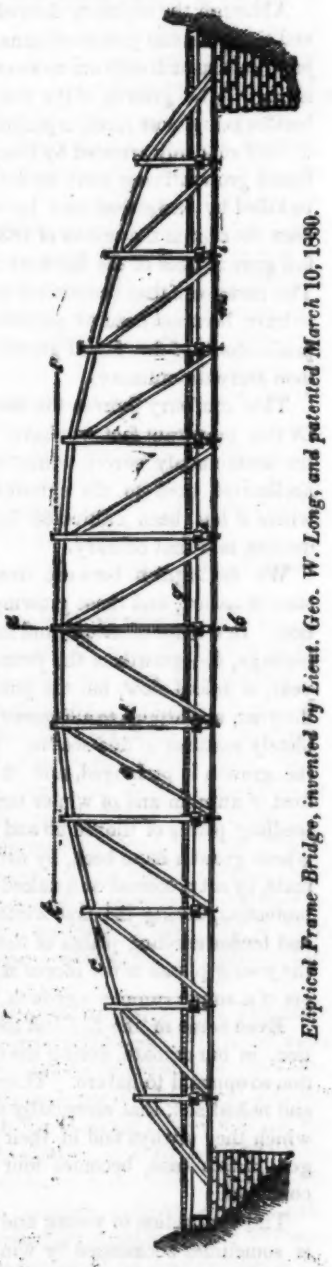
I hereby certify that under the direction of Col. J. M. Fessenden, the Engineer of the Boston and Worcester Railroad, a bridge has been constructed on that Railroad over the Charles River, on the principle of Col. Long's patent. The bridge rests entirely on two abutments thirty feet in height, and has a span of a hundred and twenty feet between the abutments. Notwithstanding the distance between the abutments which are the only points of support, it has been found to be remarkably stiff, and free from yielding or oscillation on the passing of the heaviest loads, which often consist of eight or ten loaded cars, in addition to the locomotive engine and tender. It was built by Mr. Thomas Hassard of Baltimore, and has been standing a little more than a year. It is considered by the Directors of the Railroad quite satisfactory both in principle and in workmanship, and remarkably well adapted from its firmness and apparent strength, for a Railway bridge.

(Signed)

NATHAN HALE, President
of the Boston and Worcester Railroad.

Boston, Dec. 11, 1834.

MOSES LONG, Esq., of Warner, N. H., is the agent of the patentee.



LIEUT. GEORGE W. LONG'S PLAN OF BRIDGE BUILDING.

Fig. 1—*A Longitudinal Section.*

REFERENCES—*a, b, c*, top braces; *d*, posts; *e*, braces; *g*, floorway; *i*, iron rings.

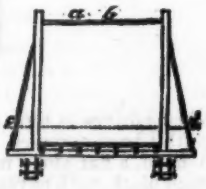
Eliptical Frame Bridge, invented by Lieut. Geo. W. Long, and patented March 10, 1830.

[From the American Railroad Journal.]

We cheerfully give place to the following communication, in relation to Lieut. Long's plan of bridge building. It will be found we think worthy of attention and should

have been published by us at an earlier day, but with many other communications, was delayed by the illness of the editor.

Fig. 2—*A Transverse Section.*



In considering the above plan for a bridge, it may be compared to a beam supported at each end, to do which, it is necessary to consider that in a beam of great length compared with the depth, it becomes a load for itself; and that a greater length of beam can be had by reducing it to the shape to be equally strong throughout, which is all that is requisite for a bridge. In a solid beam, this reduction may be had to the shape of an elipsis, and in the frame it does not differ very essentially from the same. The above frame, then, is calculated on the principle of the beam, with the strings as the first point of fracture, and the top braces as the last, and reduced to that shape to be equally strong throughout. Or it may be explained by comparing the top braces to an arch, the thrust of which is received by the strings, and resisted by them, producing between the different sets, counter stress of the same magnitude to each other, and here this plan has advantages over other framed ones, for intead of the opposing stress of the top timbers, being carried parallel to the strings as in direction of H. L. (see the figure) andrequiring a set of ties to brink it back again, these timbers are directed down, and terminates in them. This simplifies the frame, and greatly reduces the expense of it. The actual stress on the strings and top braces, may be calculated by the proportion of the depth of the frame, and half the length of it, as depth of frame, is to half the length, so is the weight placed on it, to the stress on these timbers in weight. This proportion comes from both demonstrations, by the arch and the beam, taking the strength of the beam as the depth instead of square of the depth, as in a solid beam. This stress on the timbers, it will be seen, is in their strongest directions, and thus with a proportional depth and increased size of the setimbers, the strength of the bridge may be carried to an unlimited extent, without undue expense. The drawing shows the mechanism of the frame so plainly, that it is deemed unnecessary to give very particular explanations of it.

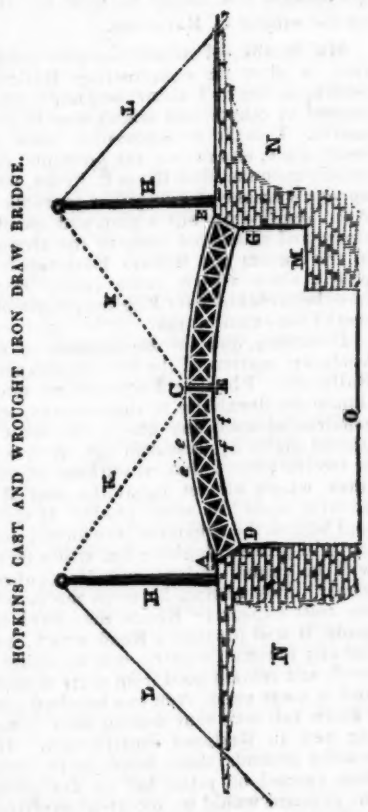
In 1831, the proprietor of the patent gave the use of it for a bridge over Tanners Creek, near Lawrenceburg, Indiana, for the first one constructed, the result of which was given him by the person to whom the use of the patent was given, Jonathan Woodbury, in the following words, viz.

"The patent which your liberality furnished me with, has been made use of, and instead of a bridge that would cost $12 or $15,000, the Committee which I informed you of for building a bridge, have just completed said bridge, which cost $3,130;" "its whole length upwards of 400 feet, and its width 22 feet, fifty feet high from the bed of the creek, and seventy-six (76) feet span between the piers, the whole of wood except two stone piers 19 feet high, from the bed of the creek, and framed timbers upon these piers for the arch to rest upon, the other part of the bridge is on bents 20 feet apart, all finished in a workmanlike manner." "That part which we are indebted to you for, is thought to be the best model ever yet found out, both as to strength and cheapness."

"The strength of your patent is thought to be almost beyond calculation, by a comparative view of its cheapness, and the size of its timbers; and should it prove as good as we now anticipate, I have no doubt but it will be a source of income to you; we shall have a fair experiment of all its qualities."

The size of the timbers given for the above bridge, was 8 inches square. The bridge is yet standing (1835) and has, so far answered the public expectations, and others are now building in the same neighborhood.

George W. Long.



Chambly, Oct. 24th. 1835.

D. K. Minor, Esq.

Dear Sir,—I am anxious to try steamboats on the Canal that is at the point of completion here. I have a schooner which is well calculated to receive an engine of ten or twelve horse power, and would put one in her if I could get it cheap. Will you please to advertise in such a way, for a small engine, that I need not be obliged to take it, if beyond my means of payment. I should like a second hand one, and if high pressure, I should not object. Will you let me know the answer to your advertisement, and if an engine is offered cheap, I will come on and see it.

I have just been making a cast and wrought iron draw bridge, of 35 feet span, of which I send you a sketch; it cost $1500, stone work and all.

From A to B is 36 feet, the versed sine of the arch is 2 feet, and the depth of the rib from C to E is 2 feet. The bridge is composed of 3 ribs, like the one A C B E, braced together, and planked over the top. The upper bar A C B, and the posts *e f*, *e f*, are composed of iron cylinders (cast), through which wrought iron rods are passed; the cylinders are 2½ inches in diameter, and the rods passing through them are 1¼ inches; the rods passing through the post cylinders have eye bolt heads, and the rod that threads the upper cylinders passes also through these eyes; the post rods pass through the lower bar D E G, which is of wrought iron, ¼ inch by 3 inches; the braces should be hollow cylinders, whose exterior diameter is 1¾ in., and which are ¼ in. thick; but it was found difficult to cast them here, and they were cast feathered. At G and D are cushions of wood to receive the bridge, in descending the posts. H H are hollow cylinders, furnished at top with a cross rod and drums for the lifting chains K K, and a counterpoise of 6 cwt.

The weight of iron is,

Cast Iron, . . .	14,312 lbs.
Wrought Iron, . .	9,389

You will see that the object in making the upper part of the bridge cast iron was to resist the crust, and that the lower part was wrought to resist extension.

Will you send me your Canal Map?

Your obedient humble servant,

Wm. R. Hopkins.

[From the American Railroad Journal.]

Sir—My attention was forcibly drawn to the remarks of your correspondent, in the January number of the Journal, on the subject of Suspension Bridges, and more especially with his liberal and magnificient design of erecting such a structure at the Fulton Ferry. The views of that gentleman are worthy of the enlightened state of the arts, and in keeping with the advancements of the age; and although the measure he proposes has elicited no public attention, that I at this distance am aware of, it has doubtless made a permanent impression upon the minds of those within whose peculiar province it falls.

It is not my intention to say any thing in addition to the subject of his communication; but as it is connected, in my mind, with the design of this paper, a recurrence to it serves as a suitable introduction to a notice of a Bridge upon a new plan, which the inventor is about to patent, and which, to my view, seems to possess a peculiar adaptation to the site of the Fulton Ferry, whilst its general application would not be less profitable in minor constructions.

A Bridge of the form that I am about to speak of, may be termed (without impropriety, I suppose,) a Suspension Bridge; but the important point on which I differ from those at present known, consists in the employment of continuous bars of wrought iron, instead of chains made up of links; thus (ceteris paribus, diminishing the weight of the metal one half, and probably in the proportion of two to five, and also) enabling the architect to extend his bars much more tensely than can be done with chains in the present mode of erection. Indeed, in a span of one hundred or one hundred and fifty feet, the tension can be given so as to present but a slight departure from a straight line, and the curvature will be nothing more than that which results from the elasticity of the metallic bars themselves.

It is proposed to secure these bars, at their extremities, and to pass them over abutments (and peers where they may be required by the breadth of the stream,) in a manner no wise different from the usual chain-fastenings; but as they will assume

but a very slight curve from *sagging*, compared with the catenarian curve, which gives a corresponding obstruction to the waterway, unless the suspension towers have considerable elevation, these abutments will be required to be raised but to a moderate height above the surface of the stream, thus reducing to a great extent the cost of a bridge in all situations, and demonstrating the practicability of its erection on sites where otherwise the expense would not admit of them for many years to come, and in some, most probably, never.

Moreover, a Bridge of this construction may be provided with a draw, upon a plan, which I believe, is equally novel and ingenious. This is to elevate the two piers, inclosing the draw, to a height sufficient to pass the tallest vessel that may apply, and over these to extend a second series of the continuous bars, terminating in braces, which may be securely fastened in various ways at the ends. The moveable floor is suspended from these by pendulous rods, whose upper extremities are attached to the axles of two or more flanged or grooved wheels, plying upon the upper series of bars in such manner that when the draw is closed, the wheels repose in the midway of the opening, and as it is opened, recede *pari passu*, with the floor towards the pier. If a Bridge on this plan were built at a point of great thoroughfare, an accessary pathway for foot passengers might be made by a stairway over the summits of the piers, while the opening of the draw would only obstruct the passage of vehicles.

In addition to economy of construction, the inventor thinks it is an important feature, that if any parts need renewal, they may be removed without impairing the strength, and replaced by others, and thus the whole structure be consecutively renewed, like the gradual absorption and deposition of the particles of the living frame.

It was not my purpose to say more (nor indeed so much) of the form of this Bridge at present. That objections may be suggested against it, I have no doubt, but I think they are all susceptible of removal or obviation, and none can apply that do not attach with much greater force to Chain Bridges, whose utility and adaptability to the most critical and difficult situations are not now matters of question. My object was to call to it the attention of those of your readers who are more qualified by their habits and experience to judge of its claims, and perhaps to draw forth their opinions.

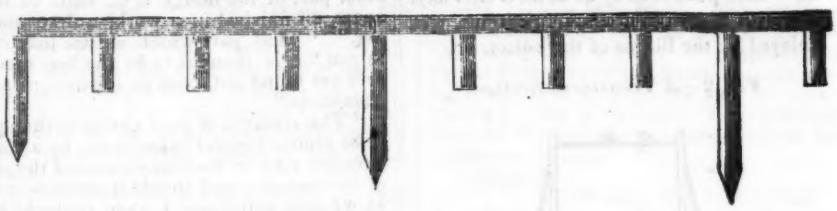
S. M.

Baltimore, March 12th, 1835.

Accompanying this communication we received drawings of two forms of this Bridge, both intended for draws, and one in illustration of the stairway, for foot passengers. They were not intended for publication, yet they are at the service of any gentleman who may desire to examine them. The plan certainly has novelty, if no other merit for its recommendation—and we ask for it an attentive perusal.

The John D. Aymar, which arrived yesterday from an unsuccessful expedition after Mr. Bowen, lost one man overboard, and another fell from the mast just after leaving Liverpool and broke his leg, leaving but three able hands. She had rough weather, and the whole trip shows, what indeed was known before, that in the open ocean, the best pilot boats are no match for our packets.—[Journal of Commerce.]

HASKINS' PLAN FOR CONSTRUCTING RAILROADS.



[From the American Railroad Journal.]

The following plan for constructing Railroads, is submitted for the consideration of our readers. It will be found useful, in many parts of the country, for passing soft or marshy ground, and perhaps for the construction of cheap roads. We are truly obliged to Mr. Haskins, as we are to every gentleman, who favors us with his views on the subject of Railroads.

MR. MINOR,—I subjoin, for your publication, a plan for constructing Railroads, which, so far as I know, has not been advanced by others, and which may be found useful. I made a suggestion, some four years since, embracing the principle, in an article upon the Mad River Railroad, which appeared in one of our public journals. In April last, I drew out a plan and specifications, and submitted them to the Directors of the Aurora and Buffalo Railroad Company; since which, some copies thereof have been obtained for Engineers upon other works for examination.

Durability, and the *maintenance of fixed levels*, are matters of the first importance, in Railroads. I believe Engineers do not estimate the durability of these works, when constructed upon any one of the most approvad plans at present in use, at over ten or twelve years; that is, without expenditures which almost equal the cost of rebuilding upon the same grade. If this is so, I believe the subjoined plan for constructing will prove valuable; for, while its cost will be found (where suitable timber is plenty) intermediate between the *most* and the *least* expensive Roads that have been made, it will produce a Road which, without any material repairs, will maintain its level, and remain good from sixty to eighty, and in some cases even one hundred years. I know full well that *driving piles* is nothing new in Railroad construction. Over marshy grounds these Roads have always been carried on piles, but on dry ground, the expense would be too great to drive as many piles as would be needed for *all* the rests. The proposed plan is designed to secure a fixed level for very long periods of time, without undue expense. The grading will be the same in this as in other cases.

The engraving below, exhibits a vertical section of Road, the stretchers which are to receive the rails, resting at either end, upon piles driven into the earth, and intermediately upon blocks of wood. The stretchers and piles are each one foot through, and the blocks the same. The piles varied in length, as the soil varies in which they are to be driven, the depth being always such as to secure their firm position, against the action of frost, or of rains, in softening the soil. Piles thus driven, at distances to accommodate the length of the stretchers, when cut off to the grade, become *fixed points of level*. The blocks—used intermediately, to save expense—to have sawed, parallel ends, and to be adjusted to the same level as the piles, the earth being driven in tight around them. Their length I have assumed at three feet. When at hand, a flat stone might be laid beneath each block, with advantage. These blocks, by the use of the Road, will, in time, settle more or less; but, as each end of the stretchers remains *fixed* upon the piles, these central depressions may, at any time, be elevated to a horizontal line, by wedges driven under the stretchers, upon the heads of the blocks—a process alike cheap and effectual.

The length of the stretchers, and the distance between the supports, or blocks, will be matters of consideration. The former I have assumed at twenty feet, and the latter four feet. Probably, as the stretchers will rest upon the soil, the distances between the supports may, in many Roads, be considerably greater than this. The stretchers should be tied, at suitable distances; though few ties will be necessary, if the stretchers be firmly bolted to the heads of the piles. These ties, when a horse-path is intended, should be cut away in the centre, so that the gravel of the path will form a smoother surface above them.

The piles, blocks, stretchers, and ties, which constitute *the whole work*, except the iron rail—if of beach, cedar, or locust, and cut in winter, will exceed in durability the extreme of human life.

R. W. HASKINS.

Buffalo Sept. 4, 1835.

TEA IN INDIA.—A Calcutta paper gives the following account of the discovery of the Tea plant in India, from which it appers possible that it may become an article of trade from that country.—[Boston Adv.]

TEA PLANT.—We understand that further discoveries of the Tea plant have been made on our eastern frontier among the Muneepoor hills, and that some specimens of the leaves have been sent down to the Agricultural and Horticultural Society, and are now in possession of Dr. Wallick.—Major Grant has the merit of this new discovery. The plant was pointed out to him in the hills by Shans, who knew it well, having visited the tea garden cultivated by the Chinese. But we are told, the specimens of the leaf, (which we have not seen,) from want of a proper curing, are not in a state to render it possible at present to judge of the quality of the tea that might be obtained in that district. In the meantime it is very satisfactory to know that the plant is common among those hills in a large extent of country, and that we have thus a double resource in our own neighborhood, which may hereafter render us independent of China for a commodity become so necessary to the comfort of Europeans, and so very important as an object of trade. The hills in Muneepoor, on which the tea plant is indigenous, must be of considerable elevation, for in a letter we have seen describing the successful result of a late harassing expedition against some freebooters, it is mentioned that, in two days' march from Sangonoo, the party found themselves among pine and oak forests, and that the nights, even in the middle of March, were extremely cold.

During the violent southwest gale on Wednesday evening, nearly the whole of the western wall of the new Catholic Church now being erected in Jersey City was blown down. We learn that the foundation of that part of the building had settled considerably, having been laid upon newly made ground.—[Gazette.]

NEW-YORK STATE AGRICULTURAL FAIR.—Again, as in previous years, we were unable to attend the State Agricultural Fair at Albany; we have, however, been furnished by a friend with the following reports of the different Committees, which we lay before our readers.

In the SUPERVISOR'S ROOM, there was a fine display of vegetables and fruits, evidently showing that Horticulture is beginning to take its proper place in the estimation of our farmers and gardeners. The report of the Committee points out those specimens most deserving of notice.

The Committee "On the Productions of the Garden," consisting of Messrs. P. N. Shankland, James Wilson, James G. Tracy, Alexander Walsh, L. B. Slingerland, Isaac Deniston, and —— Brigham, are gratified in being enabled to report that there has been exhibited of the products of the garden an unusual variety of choice and rare articles, unequalled by any former exhibition.

To the blessings of a fruitful season, have been added a greater degree of exertion, and a commendable spirit of rivalry on the part of the gardeners.

The utility of Agricultural and Horticultural Societies is strongly impressed upon the minds of the Committee, from which the degree of interest and spirit manifested, by those in attendance, the knowledge gained by an interchange of sentiment and views on these subjects, cannot be otherwise than useful to the community, and we are confident that the beneficial effects of such exhibitions will become annually more and more visible, and cause efforts that will constantly advance them to greater degrees of merit and usefulness.

P. V. SHANKLAND, Chairman.

Among the articles exhibited, they would notice from the Garden of J. Buel, Albany, Alexandrian Russian apple; 1 Spanish pumpkin, weighing 92 lbs.; new Egyptian wheat; butter squash; Constantinople pumpkin; Egyptian corn, (immature.)

P. V. Shankland—Superb quince.

Alexander Walsh, Lansingburgh—7 varieties of foreign and 5 of native grapes; sweet potatoes, one weighing 2 lbs.; strawberries; filberts; white and purple egg plants; Windsor beans, in fine green state; Lima cocoa-nut squash; auxalis cretanta; broncli and hops, 1st and 2d growth of 1835, (Petelea trifolia); pea-nuts; chinquapins; celery; mangoes; 6 bouquets, green flowers, and a great variety of beautiful Dahlias. An Horticultural Trophy, formed of the gardener's implements, displaying fruit and flowers of their own production, from the prominent parts of which were suspended madder root and teazles, fresh from the garden; silk and cocoons of 1827; perennial flax, dressed and in the green state; skinless oats; African millet, (milium nigrocons,) and espenset, a French clover.

The pedestal tastily ornamented with a quantity and variety of choice vegetables.

G. Peebles, Lansingburgh—Very superior citron, etc.

D. B. Slingerland, per Chas. Gilchrist—3 large Valparaiso squash, from 25 to 40 lbs.; 6 varieties of foreign grapes; 3 varieties of native grapes; 12 choice varieties of apples; 4 varieties of pears, viz. bon creton, bergamots, vergula, and sickle; tomatoes; apple squash; Carolina potatoes; mock orange, and six large bouquets of flowers.

James D. Wasson, Bethlehem—14 large heads of white and red brocoli, Valparaiso and butter squashes; very superior pinkeye and kidney potatoes; 2 fine bell squash; 2 round Valparaiso squash.

L. Cruttenden, from Cruttenden Desert, Albany—6 Valparaiso squash; 1 basket superior long pink potatoes; turnips; beets and carrots, large and fine.

Stephen Van Rensselaer, jr., by J. Whalen—Superior purple egg plant; blood beet; turnips; grapes; white and sweet water, grey cluster, fine; very superior Spanish cluster and native grapes; Dutch and English spinnage; several pots greenhouse plants; large bell and squash pepper; 2 sorts Lima beans; globe artichoke; French peas and Seneca grass.

From the Albany Alms House, G. W. Welch, Sup't—4 large heads cabbage, from 20 to 28 lbs.; 5 large beets, one 23 lbs.; turnips; radishes and carrots.

Alexander Avery, Coeymans—1 superior butter squash, 6 lbs.

Francis Bloodgood, Albany, by gardener—Purple brocoli; superior large parsnip; silver skin and yellow onions; Valparaiso squash; turnip beet.

James Wilson, from Albany Nursery—Superior carrot.

C. Van Pelt, Brunswick—1 potatoe, curiously formed, weighing 4¾ lbs.

Capt. Weaver, Lansingburgh—Mammoth blood beet.

Hiram Van Pelt, Brunswick—1 large yellow pumpkin, 58 lbs.; 1 do. 46½ lbs., measuring over 5 feet in circumference; 1 curiously formed human figure potato.

R. Fisher, Lansingburgh—Superior fall pippin apples.

J. Wallace, Lansingburgh—1 pumpkin, 55 lbs.; 2 Valparaiso squashes.

Geo. A. Hoyt, Albany—2 fine ruta baga turnips; 5 ears Dutton corn.

Samuel Walley, Bethlehem—4 knob radishes.

C. N. Bement, Albany—Ruta baga, very fine; curiously glove formed Sweedish turnip; 6 large ruta baga, 14½ inch; 5 varieties of potatoes.

From Orphan Asylum, Daniel Payne—Fine specimen Tuscarora corn; fine Windsor beans; peppers; very splendid China pinks.

Henry D. Grove, Hoosack—9 clusters very superior grapes, native.

E. Cheesebro, Guilderland—1 bag superior large pink-eye potatoes—raised over 100 bushels on ¼ acre; 6 large round turnips.

Mr. Cobb, Washington street—1 Patagonian gourd, 5 feet long.

Honorary premiums were awarded to the following gentlemen, viz:

Jesse Buel, Alexander Walsh, D. B. Slingerland, T Van Rensselaer, jr., Francis Bloodgood, C. N. Bement, and to the following, Works on Agricultare, &c. viz:

Charles Gilchrist, Bridgman's Gardener.
James D. Wasson, New-York Farmer.
L. Cruttenden, Bridgman's Gardener.
Jeremiah Whalen, do. do.
G. W. Welch, New-York Farmer.
J. Avery, Cultivator.
Bloodgood's Gardener, New-York Farmer.
H. Van Pelt, Silkworm.
J. Wallace, do. do.
G. Peebles, do. do.
Samuel Walley, Cultivator.
Daniel Payne, Bridgman's Gardener.
Henry D. Grove, Genesee Farmer.
Rufus Fisher, Silkworm.

[The remainder of the reports have not yet come to hand.]

The Farm Stock presented at the Albany Fair was not so numerous as in some preceding years, but excelled in all the excellence required by the farmer, and displayed a degree of perfection in the animal kingdom seldom surpassed in any other country. The following were presented as entered.

Edward Long, Cambridge, Washington Co., 1 beautiful blood horse.

Samuel Waite, Montgomery, Orange Co., 3 South Down sheep; 1 ram and 1 ewe.

Chas. Mills, Wallkill, Orange Co., 1 full blood Durham bull.

C. N. Bement, Albany—
2 Durham Bulls.
1 do. Heifer.
3 do. Yearlings.
1 do. Bull Calf.
12 South and Hampshire Down Ewes.
3 do. do. Bucks.
4 Bakewell Ewes.
7 Berkshire Pigs.
2 Improved China Pigs.

M. Bullock, New-Scotland—
6 2 year old Durham Improved Heifers.
6 Yearling do. do. do.
1 3 year old Imported Bull.
1 1 " " Durham "
5 Bakewell and 2 Costwold Ewes.

J. N. Bullock, New-Scotland, 1 full blood Durham Cow.

S. Van Rensselaer, jr.—
1 Superior Spotted Cow, for beef.
1 Spotted Bull, 2,250 lbs.
1 do. do. 1,100, 18 months old.
1 do. do. 700, at 6 " "
4 Durham Cows.
4 do. Heifer Yearlings.

Erastus Corning—
1 Imported Durham Milch Cow.
2 3-4 do. do. do.
42 Bakewell Sheep.
1 Imported Cheshire Boar.

W. Akin, Greenbush—
1 pair Twin Working Oxen.
1 Half Blood Durham Heifer.
1 " " " " " " Steer.

W. Teller, Greenbush—
3 Working Oxen, 2 abreast, 1 ahead.
2 South Down Rams.
2 do. do. Lambs.

Chas. H. Hall, Greenbush—
1 Durham Bull.
2 do. Heifers, 2 years old.
3 Beef Cattle.

I. Deniston, Albany—
1 Sorrel Mare, 8 years old.
1 Bay Horse, Young Lovel, 5 years old, and 4 colts, all from the above.

A. McDuffie, 1 Chesnut Sorrel Horse, 4 years old, from Sir Henry.

A. E. Brown, Albany, 6 Berkshire Pigs.

James Mallows, 1 Berkshire Boar.

Jno. Lawson, 1 do. Sow.

H. Holland, Ballston Spa, 11 Berkshire Pigs.

S. Wells, 1 Berkshire Pig.

Report of the Committee on Farm Implements, &c. The Committee examined five.

THRESHING MACHINES.

1. "Lane's Patent Railway Horse Power Threshing Machine,' presented by D. Roberts, and manufactured at Waterford, Saratoga county. The proprietor alleges that one horse will thresh 75 bushels of wheat in 8 hours, attended by four men; that when the horse walks 2½ miles per hour, the cylinder, or thresher, revolves 1200 times per minute. Price of the Machine, $150. For sale by Charles Down, and others, at Waterford. The horse power is on the principle of the endless chain, and the power is imparted to the threshers by means of

a band. The 4 arms of the thresher are cast iron, with wrought iron teeth. The wheel disbands where the motion is obstructed by a stone or other hard body.—The horse treads upon iron rollers.

2. "Shaw's Patent Threshing Machine," one horse power—price $75—alleged by the proprietors to thresh 80 bushels of wheat in 8 hours, attended by 4 men and a boy. The machine occupies 8 by 2½ feet, and is moved by straps. The horse moves in a circle. A wheel and strap are affixed to each one of the axes of the threshing cylinder, which equalizes the motion. The cylinder has four arms of wood, and the teeth are secured in them by wood screws—length of the arm 18 inches—supposed to revolve 1,400 times in a minute. Wolverton, Barney and Hart, of Albany, proprietors for the counties of Albany, Schoharie, Saratoga, Rensselaer, and Montgomery.

3. "Pitts' Patent Horse Power, and Threshing Machine," constructed on principles somewhat similar to No. 1—2 horse power. The horses tread abreast upon wood, and the legs are prevented from sagging by a series of what the inventors call "surface rolls." The cost is $125—the fourth of which is for the thresher—will thresh 100 bushels of wheat in 8 hours, attended by three men and a boy—4,000 bushels of grain have been threshed without any repairs.—This machine is manufactured at Waterford and Buffalo.

4. "Gleason's Patent Threshing Machine, with Baker's Horse Power"—one horse power, upon the endless chain principle—price $150. The horse travels upon wood. Machine is said to have threshed 275 bushels of oats in 9 hours, with two horses, to relieve each other. The frames of the horse power and machine were of *cast iron*, admirably adapted to combine strength and *lightness!* The first weighing 350, and the latter 180 lbs. Manufactured at Waterford.

5. "Burrall's New Combination Threshing Machine," presented by the inventor, Thos. D. Burrall, who resides at Geneva, Ontario Co.—price from 35 to 45 dollars, without horse power; of machine and four horse power, $125; do. do. two horse power, $100. The larger machine requires 6 hands to attend it, and will thresh 200 bushels wheat in 8 hours; the smaller, with four hands, will thresh 100 in the same time. Cylinder 14 inches in diameter, 2½ feet long, and performs from 1200 to 1300 revolutions in a minute. Have threshed from 10 to 20,000 bushels of grain without repair. This machine differs from most machines, in being so contrived as to separate the grain, principally, from the straw, in the process of threshing; threshes and screens alternating in the bed piece, which may be varied at pleasure; threshes all kinds of grain. As the Committee could only *examine* the machines, and saw but the momentary action of the three first named, they cannot safely give opinions as to their absolute or comparative merits; they appeared all to be substantial and useful labor-saving machies, entitled to public notice and patronage.

CORN CULTIVATORS.

1. "Van Bergen's Corn Cultivator," (Coxackie) presented by C. N. Bement.—The sides expandable in parallel lines, so as to be adapted to spaces between rows of different breadths, and the shares may be adjusted to turn the earth in or out. A new implement, and apparently a good one, drawn by a horse. Price $1.

2. Bement's Expanding Corn Cultivator. C. N. Bement, of Albany, proprietor and inventor, The improvements on the common Cultivator consists in a wheel and clevis, by which the depth may be regulated, double pointed shares, and two scarifyers inserted between the shares. Expandable from 18 to 36 inches.

The utility of the Cultivators in dressing corn and other head crops, in saving a vast amount of manual labor, in almost superseding the hand hoe, and in doing the work better than the plough, in most cases, induces the Committee to recommend them to the general notice of our farmers. [See the common cultivator figure in the June number of the Cultivator.]

DRILL BARROWS AND CORN PLANTERS.

1. Bement's Turnip Drill.—C. N. Bement, of Albany, inventor and proprietor.—A hand barrow for drilling turnips—price $8, and an extra cylinder, adapted to sowing peas, mangel wurtzel, &c. for an additional 50 cents. [This is a modification of the drill barrow figured in the June number of the Cultivator.]

2. Burrall's Corn Planter—for one horse, arranged to plant corn in hills or drills, at any required distance, and to regulate the quantity of seed. A nose piece levels the ground, a coulter opens the drills,—two teeth cut the little side furrows made by the drill, and throw the mould over the seed,—a wheel follows to press the ground upon it,—and a scraper cleans the wheel of dirt. Invented by T. D. Burrall, Geneva.—Price 16 to 18 dollars. This is an ingeniously contrived and useful machine, altogether new to us, and promises to be of great utility, not only in planting corn, peas, and beans, but in drilling small grains.

3. Robbins' Corn Planter and Turnip Drill.—Invented by Mr. Robbins, of Lewis county, and presented by C. N. Bement.—It drills six different kinds of grain—has been sometime in use, and is highly approved. Price $15.

The drill barrow is a modern introduction among us, and is a valuable labor-saving machine, particularly in the cultivation of ruta baga, turnips, mangel wurtzel, &c. The drilliug of small grains is much practised in Europe, and with the introduction of these implements, the practice may be found to be advantageous here, as it affords the advantage of keeping the crop free from weeds, and of keeping the surface of the ground loose. In the turnip culture, which is now fast gaining a footing among us, the drill barrow is almost an indispensable implement.

STRAW CUTTER.

Green's Straw Cutter, presented by C. N. Bement, was the only implement of this kind exhibited. It is a hand crank power. It is 5 feet long by 2½ feet wide. It has 12 knives, 8 inches long, on a 4 inch cylinder, and works upon a cylinder or roller of lead—will deliver two bushels of cut hay per minute—feeds itself, and may be managed by a stout boy. Price, highly finished, $30. The Committee do not hesitate to recommend this as the most complete and perfect implement of the kind which has come under their notice. [Figured in the Oct. number of the Cultivator.]

CLOVER MACHINE.

Burrall's Clover Machine, invented and presented by D. T. Burrall, appears to be a very perfect implement. It may be propelled by a two or four horse or water power, and with the attendance of a man, will clean from 16 to 32 quarts of seed in an hour. The current of air created by the motion of the cylinder, with its serrated teeth, is made to perform the winnowing process in the upper half, or semi-circle of the machine—the chaff being thrown off, and the seed falling into a box beneath while the clover heads, or hulls are whipped out in the lower half. No seed is apparently wasted, and all resisting bodies are readily thrown out without injuring the machine. The proprietor asserts it to be the only machine which separates the seed from the hull *without rubbing, heat or waste, at a single operation.* Price $60.

The highly profitable practice, in improved husbandry, of alternating clover and other grasses with tillage crops, and the consequent increasing demand for seed, renders every improvement in the process of cleaning clover seed a public benefit. The Committee recommend this machine, with strong confidence, to the public patronage.

STUMP EXTRACTOR.

Burrall's Stump Extractor, invented by D. T. Burrall, is of cast iron, about two feet square. It is a combination of power afforded by the screw, lever, and wheel, mounted on an axle and wheel. One horse, operating on a ten foot lever, will raise 25 tons. Price $80.

HARROW.

The only one exhibited was a pair of *"Craig's Scotch Angled Harrows,"* presented by Mr. Craig, the maker, West Galway, Montgomery county. The wood work is light, but strong, contains 40 teeth, each tooth is ¾ inch, and 10 inches long, of highly tempered Swede's iron. The harrows may be worked together or separate—an excellent implement on all soils—particularly for seeding. Price $15 the piece. [Described and figured in the August No. of the Cultivator.]

SMUT MILL.

Smut Mill and Grain Cleaner—invented by Wm. Battell, Albany—a cast iron cylinder, 2 feet 4 inches diameter, 3 feet high. Mr. Battell being engaged on another Committee, no information was obtained of its performance or price.

CHEESE PRESS.

Kibbey's Cheese Press. This press is figured in the May No. of the Cultivator, since which it has undergone material improvements by the inventor, S. Kibbey, Esperance, Schoharie. It is three feet long, 16 inches broad, and 5 feet high. It is a combination of mechanical powers—the force being applied to a short lever—the power of which may be judged from the fact, that a 10 pound weight, at two feet from the fulcrum, causes a pressure of 1600 pounds, and its power may be carried to any extent by corresponding strength in the main wheel and shaft. The piston descends perpendicularly, and its friction is taken off by a friction roller. Price $15.

This press is admirably adapted, on a commensurate scale, to the pressure of hay, hops, cotton, &c., and to the manufacture of cider.

CHEESE PRESS.

Stebbins' Semi-Revolving Slide Cheese Shelves, is an admirable contrivance to save labor in the cheese dairy. By it a woman can easily turn 24 heavy cheeses in a minute, and is enabled to roll them without their being lifted from the shelves. The model consists of an upright frame, suspended by an axis passing through its horizontal centre, and into which slide eight pair of shelves, the distance of which may be graduated to the size of the cheeses. The cheeses are placed alternately above and below the axis. Slats are fixed upon the back of the frame to prevent cheeses falling out when the frame revolves. The

frame is made stationary by a pin; and when this is withdrawn, it is made to revolve half round upon its axis, which turns the cheeses; the shelves over them, and upon which the cheeses have lain the preceding day, may then be withdrawn, and left to dry till the next day, when they may be returned, the turning process repeated, and the other shelves cleaned and dried in turn. The improvement is a valuable one in large dairies. Henry Wilber, of Richfield, Otsego county, is the inventor. The price of a single right to construct is $5. [For further description see letter of E. Perkins, in Nov. Cultivator.]

Though not coming exactly within their province, the Committee cannot but notice, with high commendation, an improved *Bee Hive*, with a swarm of bees in it at work, exhibited by the inventor, Levi H. Parish, of Brighton, Monroe county. Externally it appears as a square-box. The two ends and back have doors which open upon hinges, the end ones into the interior of the hive, and the back one covers a large pane of glass, through which the condition of the interior, and the operations of the bees, may be observed. There is an upper chamber above these doors, which opens by a lid at the top, and discloses four boxes, nicely adjusted, into which the bees ascend through an aperture from the main hive, and deposite their honey. These boxes may be taken out and returned at pleasure, without destroying or disturbing the bees, and thus the proprietor may be furnished with a constant supply of truly excellent honey, without diminishing his stock of bees. The bee moth, it is believed, is less liable to trouble this than ordinary hives. Channels are cut in the under side of the upper lid, leading to an aperture in the edge, to carry the rarified and vitiated air which is engendered in the hive. The price of a single right to construct these hives is $5.

The Committee regret that time and circumstances did not afford them a better opportunity of examining the several machines and implements offered for their inspection, and of testing their utility by a satisfactory trial. Yet they cannot refrain from expressing their strong conviction, that an annual examination of new agricultural machines and implements, by a competent board of scientific and practical men, to be selected and paid by the government, would prove of incalculable advantage. Human labor has been astonishingly abridged in the mechanic and manufacturing arts, by improved machinery and the labor-saving contrivances—agriculture is also susceptible of being benefitted in like manner; but the incompetency of the farmer to judge of the intrinsic value of an implement at first sight, the frequent imposition of spurious and defective ones upon them, and the difficulty of obtaining correct knowledge of their merits, induces distrust, and prevents the more general introduction of many implements that would be highly valuable. A board of inspection would stamp a seal upon whatever had merit, determine its relative merits, and give confidence to the purchaser; while, on the other hand, the want of the approving certificate, would justly excite distrust, and prevent imposition.—This board might have an annual report, which by being promulgated in over 150 journals, would give, to the state at large, interesting and prompt notices of all new inventions calculated to promote the agricultural, and consequently, *every* subordinate interest of the Empire State. The Committee hesitate not to predict, that $1000 annually appropriated to this object, to be awarded in premiums by a competent board, would add ten times its amount to the products of agricultural labor, and yield a compound interest to the revenue of the State.

J. Buel, Chairman.

Albany Fair.—The Committee on Manufactures, consisting of Benj. Knower, Samuel Blydenburgh, Egbert Egberts, Gurdon Corning, R. M. Meigs, by their Chairman made the following report.

The Committee on Manufactures can truly say that they want words to express their satisfaction on witnessing the rich and tasteful specimens presented, and contemplating the amazing improvement since last year's exhibition; and more especially since the short period, which can scarcely be considered over ten years, when we were wholly dependant on importation for jackknives and blankets. It is also a subject of pleasure rather than regret, though it may subject the public to two readings, that such has been the interest excited by the exhibition, that our official report has been editorially anticipated. But trusting readers will view it as we do, as a proof of its importance, we have no doubt they will be willing to read it again.

Articles of American Manufacture, and specimens of Art, exhibited in the Mayor's Room, of the City Hall, Albany, on the 13th and 14th of Oct., 1835.

THE COMMITTEE REPORT.

1. Specimens of Crown Window Glass, manufactured at Redford, Clinton co. New-York. A most superb article, exhibiting a degree of improvement in the art of glass making, far above any thing we have ever seen before, from any country. Made by Cook, Lane & Corning—presented by Dr. G. Corning, Troy. [Honorary premium.]

2. Two pair Woollen Hose and samples of Stocking Yarn—Mrs. E. M. Viele; one pair hose from Saxon wool, the other from Merino—showing a fair specimen of the characteristic difference; excellent—John I. Viele, Esq. [1 book.]

3. Two Piano Fortes, made and exhibited by Cole and Warren. [Honorary premium.]

4. Flute, mounted and finished in elegant style, and 1 superb Piano Forte—Meacham. [Honorary premium.]

5. One case Hardware, consisting of screwplates and various other articles; the screwplate made by King, of Waterford; and one of surgical instruments; also 10 circular saws and meat saws. The whole elegant articles, and of superior finish—Norman Francis.

6. Various specimens of Painting, in imitation of marble, rosewood, curled maple, and oak—a most extraordinary production, surpassing any thing we have seen of the kind—Samuel Johnson. [$3 premium.]

7. Two Mahogany Hall Chairs—first rate workmanship and materials—Alvord and Winne.

8. One pair of 6 inch Globes—a handsome article.—Z. Standich. [$1 in books.]

9. Copper and Brass Ware, consisting of urns, tea kettles, &c. made by hammering, without aid of swedging—all superior articles, and well worthy the attention and encouragement of the public—Wm. Kline. [Honorary premium.]

10. Two Hearth Rugs—a very handsome and fair article—Mrs. C. Shear. [$2 in books.]

11. One Hearth Rug, by a young lady of Albany, made with a needle—a fine durable article—Miss M. V. R. [75 cts. in books.]

12. Box of Reeled Silk, in beautiful order; also a box of broken Cocoons, so prepared as to be spun without a particle of waste—the whole a charming object to the silk interest—Dr. Gurdon Corning. [Honorary premium.]

13. A piece of White Flannel, and a very fine specimen of Stocking Yarn—John H. Young. [75 cts. in books.]

14. A White Twilled Silk Handkerchief, and samples of Sewing Silk, manufactured from the productions of worms fed on the leaves of the common mulberry, in South Union, Kentucky—J. Buel. [Honorary premium.]

15. A very correct Medallion Likeness of Judge Spencer, also a fine specimen of Painting—Mr. Coffee. [Honorary premium.]

16. One dozen Bedcords—a first rate specimen of rope manufacture—L. and D. D. Shaw. [$1 in books.]

17. Patchwork, an extraordinary article, exhibiting evidence of genius, patient perseverance, and industry, in an uncommon degree—by Miss Felthousen, only 12 years old. [$2 in books.]

18. One Stain Beaver Hat and Leather Case, also a fine specimen of Boys' Caps. Rich articles, and said to have been made in the short space of three hours—E. S. Willett. [Honorary premium.]

19. Gentlemen's Bosom, a fine specimen of fancy needle work. Mrs. J. Van Buren. [$1 book.]

20. Paintings of Landscape and Animals, a fine specimen of art, by a self-taught artist, 19 years old. Van Zandt. [$1 50 in books.]

21. Paintings of Fruits, Flowers, and Fancy Pieces, very excellent. Mrs. Holmes, teacher. [$1 in books.]

22. An elegant Mahogany Sofa, of very superior workmanship. Worth & Davison. [Honorary premium.]

23. Card of Patent Spoke Bitts, a very useful and highly finished article. Steele & Warren. [Honorary premium.]

24. Specimen of Sewing Silk, of various colors, a choice and interesting article, made by the Shakers at South Union, Kentucky. Presented by A. Walsh, Lansingburgh. [Honorary premium.]

25. Three elegant sets of Harness—presented by E. B. Slasson; Bayeaux & Loyd; and William Smith.

26. Very handsome display of Visiting Cards, printed by letter press. T. G. Wait.

27. Railroad Axle, (patent,) made by Force & Davis, Baltimore—a specimen of excellent workmanship, and supposed to be an important improvement.

28. Three Decanters, cut glass—very handsome. John Heyrregen. [Honorary premium.]

29. Pair Corsetts, a very superior article of the kind. Miss Louisa Belden. [$1 book.]

30. Blank Ledger, a very elegant specimen of ruling and book-binding. Russ, Burton & Co. [Honorary premium.]

31. Two Landscape Paintings. Fuller. [$1 book.]

In regard to the two Pianos presented by Messrs. Cole & Warren, and the one by Mr. Meacham, notwithstanding the Committee consulted the best professional judges in the city, and a stranger who was recommended as very skilful, they found themselves wholly unable to give any decided preference. The instruments were all excellent; Mr. M.'s was decided to excel in power, while the others with sweet tones, were thought to possess an equivalent in delicacy of touch and correctness of

action. We can therefore only repeat that both parties may be proud of their respective articles.

With respect to the three sets of Harness, we are driven to the same conclusion. The articles were all so excellent that the Committee would do injustice to their own feelings, if not to their conscience, to give any preference to either.

The Committee would farther remark, that in the present infant state of the Institution, they have no funds to award such premiums as they are well aware are justly merited. They consider all they can give, to be merely tokens of respectful notice of the merits of the applicants—hoping that the present display may awaken the attention of the public.

S. BLYDENBURGH, Chairman.

[From the Baltimore Farmer and Gardener.]

INGERSOLL'S PIGGERY.—We republish, by *request*, an interesting description of the Piggery of Mr. Ingersoll, of Brookline, Massachusetts, which originally appeared in the American Farmer, in 1824. The details and products are no less astonishing than the economy of arrangement and systematic pursuit of his object are highly honorable to the intelligence and sagacity of Mr. Ingersoll. The farm of this gentleman, it will be perceived, is but twenty-one acres, and yet the proceeds of the sale of his hogs, fed altogether with its products, amount to $2409 60, a sum greatly beyond the yield of many farmers of several hundred acres in extent. Why is this so? The reason is obvious enough: Mr. Ingersoll has the good sense to rise superior to the prejudices of by-gone days; to strike out a plan more congenial with the spirit of the age, and the present state of agricultural science; and the result is no less flattering to his pride than it is beneficial to his pecuniary interests—while he is getting rich upon the fruits of his little farm, its soil is maintained in a state of tilth equal to the production, in luxuriance, of any thing in the vegetable kingdom.—[Baltimore Farmer.]

MR. INGERSOLL'S PIGGERY.

"Honor and shame from no condition rise,
"Act well your part, there all the honor lies."

[We have the satisfaction to publish the following account of the most perfect system of breeding swine, that has fallen under our observation. We have visited the establishment which it describes, and there heard, with pleasure, the explanations of its intelligent owner, upon the different parts of his plan. And from our desire to profit by his experience, we subsequently requested him to give us a written description of his Piggery, and the management thereof, which he promptly furnished, in a letter that invited us to pursue our inquiries, and these proucred for us the more ample details contained in his second letter. It was our wish to publish these communications soon after they were received, but we could not obtain his express permission to make that use of them; therefore, we have withheld his letters from the press until the present moment, when we are assured that the cause of his reluctance has ceased to exist; and that his plan may now be made public, without any prejudice to his interests, or violation of his wishes. This system challenges our admiration, and we cheerfully render it to his head and heart. How few of us take equal care of superior animals! And there are not many who carry equal method into their most important avocations—errors, which may justly be ascribed to defective education. It is easy to perceive, in every part of Mr. Ingersoll's proceeding, that confidence which merchants feel in the employment of capital at some risk, and heavy charges, for the production of a probable and fair, although remote profit, through a definite channel. With such hopes and calculations, education had made him familiar, whilst it gave him habits of critical investigation that must ever secure to their possessor eventual success in any occupation to which he may devote himself. As a farmer, we perceive that he has derived a handsome livelihood from the cultivation of a few acres of land, and the employment of a small capital, in connexion therewith; whilst there are many proprietors of princely estates, who can scarcely contrive to banish want from their domains. We have pointed to the chief cause of such painful deficiencies—it remains for parents to diminish their number in future times, by taking present and suitable means to qualify their children to pursue their respective occupations with benefit to their families, and advantage to society. And whilst we are zealously laboring to amass property for our offspring, let us not be unmindful of their intellectual treasures, but remember always that the improvement of these can alone teach them how to enjoy and augment the wealth that we may give.]—[Ed. Am. Far.]

Brookline, Mass., Oct. 30th, 1821.

Dear Sir,—I have, this evening, received your favor, dated 1st inst., inclosing some valuable seeds, and two numbers of your publication, for which I beg you to accept my acknowledgments. I should feel mortified that your interesting Journal should have been published near three years, without my availing myself of its information—the fact is, I have been a subscriber through our mutual friends, Messrs. Wells and Lilley, from the beginning.

I am happy to hear of the safe arrival of the pigs, and more gratified that you are pleased with them. It will give me great pleasure to send the boars you wish in the spring; and they shall, as you desire, be of different parentage from those you already have. I am fully satisfied, from repeated trials, that a fine race of animals cannot be kept up by breeding *in and in*; and I have, both in my sheep and swine, two distinct families, which are crossed with each other. And except to supply the number of each kind I want to breed from, the individuals of the same family are never allowed to come together. By attention and strict adherence to this plan of crossing, where both kinds are good, I have a fine healthy stock. The animals are improved, both in size and symmetry, and their disposition to get very fat, at an early age, has been increased. At twelve months old, the pigs you saw in my various pens, averaged 280 lbs.; and many of them exceeded 300 lbs. each. This weight, as they were fed almost entirely upon vegetables, was very satisfactory. A larger race has been often recommended to me by my neighbors. But a large race would not only require more food, but it must also be of much richer, and of more expensive quality. Boiled cabbages, turnips, and other vegetables, whose acreable produce is large, and which constitute the principal sustenance of my own breed, would make but poor returns when given to a larger framed animal.

My establishment consists of twelve breeding sows and two boars, that are kept as long as they bring fine litters of pigs—failing in this, they are fatted, and their places supplied by others of one year old, before they are put to the male. The sows are put with the boars the 1st of April, and the 1st of October, and farrow twice a year. Their inside pens are eight feet by five, and their outside pens are three by four feet. About the time they are expected to bring forth, the styes are littered with straw cut into chaff, very fine, that the little pigs may be dry and warm, without being entangled with long straw, and thus destroyed. The litters are always regulated, so as to leave not more than eight pigs to any one sow, either by changing their mothers, when necessary, soon after their birth, or by removing supernumeraries. I have always found a family of eight pigs at a month old, worth more than one of twelve; their growth being so much greater. From each outside pen the pigs have access through a small hole, to a common yard, which is always kept well littered; in which they play—and where dry corn is placed in shallow troughs to induce them to eat as early as possible. Each party knows their mother, and they find their respective pens without difficulty. These pigs are *always* weaned the 1st of October, at six or eight weeks old, that the sows may be again in the way of their duty, and my system progress. From these pigs I select seventy-two, and dispose of the rest. They are put into twelve pens, containing six each, and are fed with the best food my swill trough affords, six times per day, for the first month, and three times per day afterwards. The inside pens are six feet square, and the outside four feet by six, both planked, with a quick descent, for the dirt, &c., to be carried off. *Much, indeed*, every thing depends upon their sleeping dry and warm, and being well littered, and kept perfectly clean. In these pens they remain six months, or until October and April, when they are all transferred to the fatting pens, and their places supplied by the newly weaned pigs. The fatting pens are planked—there is a cellar under them, and each pig is allowed an area of about twelve square feet to live in; for these there are no outside pens. The fattening pens are cleaned out every morning, and fresh litter given. For three months the pigs in them are fed from the swill trough as store pigs; at the end of which time, say January and July, their fatting commences, which consists in adding for each of them three quarts of cracked corn to their daily allowance of vegetables, for three months, when they are killed as near the 1st of October and the 1st of April as may be. Thus, you will observe the 1st of October, and the 1st of April, are busy days in my Piggery, as the little pigs are then weaned, the sows again put to the boars, the fat hogs sold off, the store pigs removed to the fattening pens, and my system completed.

To feed this stock, consisting of
72 pigs from one to six months old, and
72 pigs from six to twelve months old, and
12 old sows, and
2 boars; in all

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158 mouths—we boil a kettle of vegetables, containing six bushels, to which is added one bushel of cracked corn three times a day, and after putting this mass into the swill trough and mixing it intimately, we add as much water as will make 112 gallons, or of each bushel of vegetables and corn sixteen gallons. This swill is then distributed *sweet* and *warm* to the stock, morning, noon and night, with

great regularity, in the following proportions, viz:

In October, November, and December—to each of 72 pigs, from one to three months old, one gallon; and to each of 72 pigs, from six to nine months old, three gallons.

In July, February and March—to each of 72 pigs, from three to six months old, two gallons; and to each of 72 pigs, from nine to twelve months old, 2 gallons, with 3 quarts of corn.

In April, May and June—to each of 72 pigs, from six to nine months old, 3 gallons; and to each of 72 pigs, from 1 to 3 months old, 1 gallon.

In July, August and September—to each of 72 pigs, from 9 to 12 months old, 2 gallons; and to each of 72 pigs, from 3 to 6 months old, 2 gallons, with three quarts of corn.

8 galls.	8 galls.

And these eight gallons, divided by their terms, or four, show that on an average, throughout the year, two gallons are required daily per head for the 144 pigs; or equal to 288 gallons; and to our twelve breeding sows, and two boars, we give per day, three gallons each, or equal to 42 gallons; making, altogether, an aggregate of 330 gallons; thus quite consuming our three messes of 112 gallons each. By the different ages of the pigs, as above combined, we have a constant and daily call for the same quantity of swill through the year, so that our business proceeds with perfect regularity.

Baltimore, Nov. 21st, 1835.

Dear Sir,—Your detailed account of the management of your Piggery, has afforded me great pleasure and instruction. And your very obliging offer to send me a list of the vegetables raised for your monthly supply, tempts me, not only to ask for it, but for some other explanations which you likewise proffer. I am anxious to have a summary view of the total quantity of each and every kind of food used in your Piggery per annum—the cost of raising or purchasing the food—the extent of land on which it is, or might be raised—the labor of feeding and attendance at other times—the annual weight and value of the pork killed—the usual number and value of supernumerary pigs—the probable value of your farm, of the food consumed—and the quantity and quality of the manure saved or produced, as well as the cost of an equivalent in manure, if otherwise obtainable. I have, you see, some curiosity; but I persuade myself, that it cannot give one so systematic as yourself, any trouble to answer me on each of these points, and in a way to show me by a glance of the eye, that it is better for you to convert your vegetables and corn into pork and manure, rather than buy manure and sell vegetables; whilst I shall, at the same time, be taught economy and method by your precept and example, which I will endeavor to observe, and imitate at my breeding establishment. I feel somewhat at a loss as to the manner of building my pens; and on the inclosed paper, you will see doubts exemplified in rough diagrams; your correction on these would particularly oblige me. It is my desire to build them in a long narrow shed; on one side of my barn yard: and to have, at one end, cooking and vegetable apartments.

At your request, I am induced to ask whether it would not be better, that is to say, cheaper, to steam than to boil your vegetables? I have seen it stated in the explanations of Scotch implements, published by their Board of Agriculture, in the year 1814, that one person, by a simple apparatus, may steam in an hour, food enough, say of potatoes, to feed 50 horses a day, at 32 lbs. for each horse. And I had quite concluded to procure a boiler and steaming box from Scotland, on the strength of that statement.

I have been led to make some inquiries of you in this letter, from an attempt to push your proceedings to their results; as you will see by the inclosed estimates, which will best define the most of my inquiries.

Do you give the swill warm in summer as well as in winter? Do you spay your sow pigs, or put fattening sows to the boar, shortly previous to killing? Have you used the mangel wurtzel, and observed its comparative value or relish? I think highly of it, and wish that it may be fairly tried by every farmer in this country. In our climate it is more certain and productive than any other root. On this head I beg leave, however, to refer you, for my opinions, to No. 5, Vol. III, of the American Farmer, in the notes on Mr. Cooper's account of his several crops. And

I remain truly, Sir,
Your obliged and
Obedient servant,
JOHN S. SKINNER.

NATHANIEL INGERSOLL, Esq.

Estimate of Food, Fuel, Labor, &c., employed at Mr. Ingersoll's Piggery, per annum.

6 bushels of vegetables, roots, &c. 3 times per day=18 bushels per diem, for 365 days=6570 bushels per annum, which at 25 cents per bushel,		$1542 50
1 bushel of corn 3 times a day added to the above for 365 days, equals	1095 bu.	
13½ bushels or 3 quarts per day, given to each of 144 fattening hogs, for 3 mo. or 90 days,	1215	
Corn per annum, 2310 a 50 cts.		1155 00
Fuel 1½ cords per month, sawing, &c., 18 cords,		100 00
Labor 1 man and 1 boy, wages and board,		250 00
Yearly value bestowed on Piggery, Dr.,		$3147 59
Cr. by Pork and Pigs sold.		
142 hogs *a* 280 lbs., 39,760 lbs. at 6 cts.,	$2385 60	
24 pigs, one by each sow, at each farrow, over and above 9 suckled, $1,	24 00	
		2409 60
		$737 90

Showing a difference lost by using the food in the piggery, instead of marketing it; provided the corn and vegetables are valued at a price at which they could be marketed free of expense, and also return manure enough to keep up the fertility of the soil, which I presume might be done near this city, if not near Boston.

And if this is practicable near Boston, would not the sale of vegetables and purchase of manure, be attended with less care than the piggery, and be more certain? At what price is the manure of stables to be had at Boston, say per load, of given cubic feet, when unrotted? And do your owners of market farms, who have been successful and long established, buy manure, and at what rate? An elucidation of my attempt to estimate your operations, will give me the marketable value of your vegetables at home and in Boston, as well as an idea of the expense of converting them into money by direct sale, all which will be very acceptable and useful to me personally, if you can find time conveniently to furnish it.

Estimate of Land and Labor, required for the Piggery, &c. &c.

For 2310 bushels corn for piggery, a 40 bushels per acre,	68 acres.
For 6600 bushels vegetables, 500 bushels per acre,	14 acres.
Acres for piggery,	72
For the farm purposes to support 2 horses, and 2 oxen, say grain and grass,	16 acres.
Pasturing, orchards, lots, &c.	12 acres.
Acres,	100
Labor required to cultivate 100 acres as above, say 2 hands, 12 months wages and board,	$300 00
For additional labor, spring, summer and fall, supposed to be equal to the expense of 6 hands for 6 months, or 3 hands for a year,	450 00
Annual labor, say	$750 00
A farm of 100 acres, of first rate character, might be worth $100 per acre,	10,000 00
And the increase of value, attributable to augmenting population, would be more than equivalent to the wear and tear of utensils and stock employed.	
The interest might therefore be considered as rent,	$600 00
Add for taxes,	25 00
And for labor as above,	750 00
	1375 00
Then the farmer for his time may be considered as earning on a permanent scale, over and above interest, on his capital, by his piggery, for his own support, provided the manure keeps up the fertility of his soil, about	1034 60
	*$2409 60

Brookline, Dec. 24th, 1835.

Dear Sir—

I received your favor of the 21st ulto., a long time after its date, and not until it was much worn and chaffed with its travels ere it reached me. I will endeavor to answer your inquiries in detail. The following is a "summary view of the total quantity of each kind of food used in my piggery per annum," and the months in which they are used; beginning with the 1st of July, which is about the time I begin to depend upon summer vegetables, viz:

	bush.
July and August—Mangel Wurtzel, roots and tops being the thinnings from 2 squares each, containing 62 rods,	800
Summer squashes,	200
Early cabbages,	100

* See sales of Pork and Pigs.

September, October and November—Winter squashes or pumpkins,	700
Large drum head cabbages,	800
Trimmings of mangel wurtzel, turnips, &c. &c.	150
December, January, February, March, and April—Mangel wurtzel,* (roots)	200
Carrots,	900
Ruta baga,	200
Cabbages,	1500
May—Parsnips which were left in the ground during the winter, and allowed to grow in the spring, until their tops are from 4 to 6 inches high, when they are daily dug as wanted, and all boiled,	500
June—Potatoes,	250
Early lettuce, peas, chopped up vines and pods when the peas are full grown, though still green,	250
Bushels,	6550

We always mix the vegetables by boiling some of either kind in each kettle.

My farming, or rather gardening, goes upon the principles of cultivating but little ground, and by great attention to get large crops, and in some instances two from the same land. The farm of one piece constantly in cultivation is an oblong, thus divided with an alley or walk 4 feet wide in the centre.

No. 1. Of the upper side was sowed this year with mangel wurtzel, thinned out several times as described in a former letter, and finally cabbage plants set out two feet apart, (for a winter crop,) taken from square No 3, of the lower side.

No. 2. Has now a crop of parsnips left to grow the next spring, to furnish food for the month of May. The frost, however severe, does not injure them, and they are very much liked by the hogs. The advantage of preserving without trouble through the winter makes them valuable.

No. 3. Upper side, produced parnips that were dug in the month of May, and the 4th of June was sowed with carrots. Produce 237 bushels of the short kind.

No. 1. Of the lower side was cropped with carrots this year; of the long orange kind. Produce 248 bushels.

No. 2. Bore the crop of mangel wurtzel I described to you in a former letter.

No. 3. Cabbages.—The ground was laid out in 8 beds, 4 rods long, and 1 wide; the 12th June, it was sowed with Pomfret cabbage seed, in rows two feet asunder. They were thinned out, as plants were wanted to set in other places, so as finally to stand 2 feet apart. Produce 500 bushels.

This piece of land is constantly cropped in such routine, that the same vegetable occupies the same square once in three years. Each square is annually manured with *well rotted* hog dung, and always at the rate of 4 cart loads for 40 cubic feet. The cabbage square has in addition 20 bushels of unslacked wood ashes.

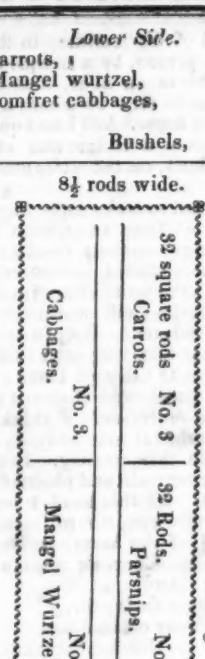
The aggregate produce this year of the whole 6 squares, or 1 1-5 acres, was as follows, viz:

Upper Side.

No. 1. Mangel wurtzel tops and roots all boiled together,	510 bush.	
Cabbages transplanted,	500 do.	
		1010 bush.
No. 2. Now filled with parsnips —no doubt,		500 do.
No. 3. Carrots,		237 do.

Lower Side.

No. 1. Carrots,	248 do.
No. 2. Mangel wurtzel,	523 do.
No. 3. Pomfret cabbages,	500 do.
Bushels,	3028



Upon the borders of this garden ground, which is one rod wide, I have a row of fruit trees. Under them we have lettuce, early cabbages, ruta baga for transplanting, and such vegetables as our family require. But upon the plat above described nothing grows to shade the crops devoted to the piggery.

A second piece of garden ground, contains a square acre, and is divided into 4 equal parts, and cropped in this manner, viz:

¼ acre, early potatoes and peas for family use. Of the peas, those not wanted, are chopped up, vines and all, and boiled in June. This land is cleared soon enough for a crop of transplanted Swedish turnips, or ruta baga.

¼ acre, summer squash. Produce 200 bushels.

¼ acre, carrots. Produce this year, 310 do.

¼ acre, cabbages. do. do. 560 do.

These two pieces of land are my sheet anchor—they are always highly cultivated and neatly dressed, without a weed allowed to seed upon them.

I annually cultivate besides, 3 acres of field land by breaking up 1½ acres, and laying down the same quantity. These 3 acres are cropped as follows, viz:

1 acre Potatoes,	250 to 300 bushels.	
1 acre Winter squash or pumkins,	700 to 900 bush.	
½ acre Cabbages,	1000 bushels.	
¼ acre Mangel wurtzel,	250	Roots, tops, &c. given to sheep and cows.
¼ acre Carrots,	250 bushels.	
	2500 bushels.	

These crops are an average for the last 3 years. My whole farm, (if it deserves that name,) is only 21 acres, within a ring fence. Of which one acre or more is occupied by buildings, yards, and approaches to them.

To carry on all my operations I keep two hired men through the year, one of whom, however, does the duty of house servant at the same time; and I hire besides day laborers and cattle to plough, to amount of 150 dollars more. It occupies about the whole time of one man, to take care of my stock, consisting of 160 hogs, 60 sheep, 1 chaise horse, 1 cart horse, and 1 cow; though they are both engaged together, and when the animals are fed, are employed in the gardens in summer, and in winter getting out manure for the next season.

In answer to your question respecting the "probable marketable value of the vegetables on my farm," I would observe that the kinds and quantities of many which I raise, could not be sold at all; as for instance, the mangel wurtzel, ruta baga, and all the tops and thinnings of others. Mr. Quincy tells me, he this year sells carrots in Boston, after carrying them 8 miles, at 9 dollars per ton, or 18 cents per bushel. Cabbages are sold by the load at 2 cents each, or about 8 or 10 cents per bushel. Parsnips and winter squashes must be retailed, and pumpkins in any quantity, would not sell for any thing.

To answer your question about market gardeners, I have endeavored to recollect, who among my neighbors have been successful and long established in that line, and I cannot select a single individual who has not driven his own cart to market, until he had sons old enough to take his place, and thus by attending to the minutiæ of the business, prevented that fraud and deception, that a gentleman farmer cannot easily avoid. When I first bought my estate, I sat up a market cart, got a stout horse, and a man well recommended, but my daily receipts kept growing less and less; my man and horse were out late every evening, and after a vexatious and mortifying experiment, I was convinced, that I must either find a market for my vegetables upon the place, and under my own eye, or give it up as a losing concern—for I could not bring my mind to the constant and daily competition, for trifling sums, which a man habituated from infancy, rather takes pleasure in.

Manure bought in Boston, costs them two dollars per buck load, of 62 or 63 cubic feet, trod hard and moderately heaped, in its unrotted state. The expense of carting put at the lowest rate, cannot cost the farmer less than $1 50 per load, and when they bring it on hire, they charge $2 50. My whole stock annually furnishes three hundred such loads, which, after using all I want, find a ready sale among the market gardeners in my neighborhood at 3 dollars per load, they taking it away with their own teams.

This manure is without any mixture of pond mud, sods, &c., which, had I access to such materials, might be very profitably increased.

As it respects steaming, instead of boiling vegetables, the only expense saved is fuel, for the same labor is necessary in filling and discharging them. Our laboring people require to have their work simplified as much as possible, and their judgment not often called into exercise. Were I to tell my man to steam 18 bushels of vegetables, and to give one-third of them three times a day to the stock, the consequence

* Cabbages and mangel wurtzel used first.

would be, that a much greater quantity would be given at one time, than another, and though the whole would be consumed in the course of the day, still the inequality of feeding would be hurtful. Besides in winter, particularly the swill, must be very warm, which could not be at night with vegetables steamed in the morning. Upon the whole, therefore, I prefer to say to him, "fill the kettle with vegetables, and after they are boiled away sufficiently to make room, put in one bushel of cracked corn and oats, and give the whole for breakfast," thus making out the exact line of duty, and leaving nothing to his discretion.

I give the swill warm in summer, and almost hot in winter, and always sweet and fresh. In conversation with Dr. Derby, he argued upon the propriety of feeding with sour food, and that cold. I have formerly tried it, and satisfied myself it was wrong. Pigs may be habituated to eat it, but place his cold sour stuff in a trough, and a good smoking hot breakfast of mine in another beside it, and I will venture to say, they will soon show a preference.

I never spay sows, because *we have no one who knows the mode*, which is to be regretted. They are sometimes admitted to the boar a few weeks before killing.

In your's received yesterday, through Wells and Lilley, you ask my opinion of the Byfield breed of hogs. As breeders they are the worst I know. The sows have small litters, and destroy them oftentimes by lying down without any care. They are long coarse haired animals, and very apt to be mangy, nevertheless to mix with almost any other breed. A Byfield boar is valuable, being a quiet race, and disposed to get fat at an early age.

The Bedford is a hardier kind, and make good nurses. But for our uses, have too much lean meat in proportion to their fat—their hams, from that circumstance, are excellent—a cross between a Byfield boar and a Bedford sow furnishes a profitable and handsome stock.

Inclosed is a sketch of my piggery. I thought it might assist you in determining the mode of building yours—I find mine convenient, and know not that I could alter it advantageously.

I have thus, my dear sir, attempted to give a comprehensive answer to your interrogatories; if there is yet any thing not perfectly clear to you, I shall be happy to explain.

My letter has run on to a great length, but your politeness, I trust, will excuse it.

Your obedient humble servant,

NATHANIEL INGERSOLL.

J. S. SKINNER, Esq.

[From the New-England Farmer]

WORMS IN THE HEAD OF SHEEP.—The few but valuable editorial remarks on the *œstrus ovis* and its progeny, which appeared in No. 4 of the current volume of the Farmer, will, I trust, receive the attention and extensive consideration of agriculturists which their importance demands, and that the prophylactic suggestions will be adopted; "an ounce of prevention," &c. The losses sustained in some parts of our country by sheep owners, from the attacks of this insect, are, I believe, much greater than is generally supposed, and the cause is oftentimes wholly unknown.

Sheep affected by the "worm in the head" soon pine away; it is impossible to fatten them. A constant running at the nose commences, first of a glairy mucus, which is succeeded by bloody and corrupted matter. They rub and sometimes strike their heads against fences, &c.; and I have observed them, particularly lambs, froth at the mouth, and jump into the air until, exhausted, they would fall to the ground.

Having in several instances succeeded in curing them, even in the last stage of the disease, I have thought the remedy I employed might be worthy of publicity. During the autumn of 1833, my flock consisted of about sixty sheep, most of them recently purchased. During the fall and winter, a number of them died; but not until in the spring, when I had lost fifteen or sixteen ewes and as many lambs, did I discover the cause. Opening the head of one to see in what condition it was in, I found several dark-headed, white worms, varying from one-half to three-fourths of an inch in length, and one-eighth of an inch in thickness. The cartilage of the nasal organ was in a sadly corrupted state. A number of the other sheep were apparently near their end from the same cause. Selecting three of the worst, I tried what I thought a desperate experiment, pouring a tea-spoon full of spirits of turpentine down each nostril. It evidently gave them considerable pain at first, but I soon had the satisfaction to see them quietly grazing. I then administered the dose to all the dirty nosed sheep in the flock, and do not now remember losing one that was full grown for many months. Last spring I found they were again affected, and repeated the turpentine potions, mixed, however, with an equal quantity of olive oil, which I thought would render it less liable to injure the sheep. The result was again successful; and, though I had despaired of ever curing some of them, this autumn the whole flock has gone to the shambles.

In several of the heads I examined, I found a long white worm, not thicker than a common knitting needle, evidently of entirely a different genus; and, on one occasion, I washed with a syringe and warm water, from the nose of a lamb, a mass of them that would have filled a cubic half-inch. The lamb died under the operation.

Be so good as to inform me if the *œstrus ovis* deposits its eggs "from the middle of August to the middle of September." How do the worms get into the nostrils of lambs in the spring?*

Very respectfully,

SAM'L ALLINSON.

Yardville, N. Y., 10 mo., 10th, 1835.

N. B. I observe in a recent number of the Farmer, a proposition to soak chesnuts in some poisonous or unpalatable liquid, in order to prevent the depredations of moles and mice. Cui bono? Just bury the chesnut as the British soldiers did Sir John Moore, and let it lay

"Like a warrior taking his rest,
With his *martial cloak* around him."

* *Note by the Editor.*—This is a question which it is not in our power to answer. We have repeatedly published notices of the supposed cause of worms in the head of sheep. The substance of what we have given on this subject is contained in the following extract from Rees' Cyclopedia, article Bott. "The manner in which the œstrus ovis or sheep bot deposits its *ova* (nits or eggs) which we have often seen, has not, we believe, ever been described; nor is it easy to see, though standing close to the animal at the time, exactly in what way this is accomplished, owing to the obscure color and rapid motions of the fly, and the extreme agitation of the sheep; but from the motions of the sheep afterwards, and the mode of defence it takes to avoid it, there is little doubt that the egg is deposited in the inner margin of the nostril.

"The moment the fly touches this part of the sheep, they shake their heads violently, and beat the ground with their feet, holding their noses at the same time close to the earth, and running away, earnestly looking at every side to see if the fly pursues: they also may sometimes be seen smelling to the grass as they go, lest one should lie in wait for them; which if they observe, they gallop back, or take some other direction. As they cannot, like horses, take refuge in the water, to defend themselves from its attacks, they have recourse to a rut, or dry dusty road, or gravel pits, where they crowd together during the heat of the day, with their noses held close to the ground, which renders it difficult for the fly, who makes his attacks on the wing, to get at the nostril."

Keeping the noses of sheep constantly smirched with tar from the middle of August to the latter part of September, has been recommended as a preventive against the fly. Insects of all kinds have an aversion to all kinds of terebinthinate substances, such as tar, turpentine, &c. The more easily to accomplish the object, it has been recommended to mix a little fine salt with tar, and place it under cover, where the sheep can have access to it, and they will keep their noses sufficiently smirched with tar to prevent the insects from attacking them.

Spirits of turpentine, to be injected into the nostrils of sheep have, been before recommended; but it has been supposed that the remedy is too harsh, and that it is apt to destroy the sheep as well as the worms. With regard to young lambs being infested with worms in the head, we can only say, as before intimated, that the fact is new to us, and suspect that a disorder called the *staggers* may be mistaken for worms in the head. "Staggers," says Dr. Willich, "is a species of apoplexy, arising from too great fulness of blood. It principally attacks young lambs, which fall down, and if not timely relieved, speedily perish. The mode of cure generally adopted by shepherds, is to blood the creatures, and to remove them to a coarse pasture to prevent a relapse."

On the whole, we consider the communication of Mr. Allinson as highly valuable, and if he has discovered an infallible specific for a disease in sheep which has proved so very destructive as worms in the head, he will have conferred a very great benefit on the agricultural interest.

[From the Vergennes Palladium.]

FOLDING SHEEP AND RAISING TURNIPS.

Let the sheep assist in raising their own food.

MR. BLAISDELL:—I perceive that occasionally a small portion of your paper is devoted to the subject of agriculture, and feeling anxious to promote so important a science, and having made some experiments, rather out of the common practice of our farmers, I take the liberty to communicate them to you, with the results. Should you consider them worthy, you are at liberty to lay them before your readers. They are as follows:

Last spring I devoted about one hundred acres of land as pasturage for my sheep, and divided it into lots of 30 or 40 acres each; the adjoining lot was composed of a fine light loam, rather shallow, but well adapted to most crops, with manure and plaster. I went into the lot on the 20th day of June, and ploughed half an acre of the above described land; I put a fence

around the same, and folded 300 sheep in it five nights.

On the first day of July I harrowed and sowed it with English turnip seed, of this summer's growth, and left the fence down: the sheep being accustomed to that spot, and preferring ploughed land to sleep on, they again yarded themselves there five nights, making in the whole ten nights, during which time we had several showers. On examination, I found the field trod as hard as a common road. I then expected the seed would not come up, but the weather proving favorable, the young plants soon appeared. Without loss of time I dusted the field with four bushels of ashes, and on the third day with half a bushel of plaster; when the plants were five or six inches high, I spent two days weeding and thinning them. On the first of September I began to pull for my own use and to carry to market. The only fault found with them was, they were too large. The crop will now show for itself, and is considered by all who have had an opportunity of viewing it, to be one of the finest they ever saw. They judge the crop will yield from 300 to 500 bushels, and I think myself it will exceed 200 bushels more than sufficient to pay the expense of harvesting.

Thus it may be seen that sheep may be made to contribute much towards raising their own food. I have sown several other small crops with equal success. And by managing as I have above described, I shall be enabled to manure my plough land, or the back part of my farm, and save the barn manure to be applied near home.

I will now compute the debt and credit.

Say the yard, Dr.

To two hands and team, ploughing and fencing,	$2 25
To seed,	0 25
To two hands and team half a day, harrowing and fencing,	1 12
To 4 bushels ashes and dusting,	0 60
To half bushel plaster and dusting,	0 35
To two days' work weeding and thinning plants,	2 00
	$6 57

Credit.

By 200 bushels at 25 cents per bushel,	$50 00
Balance,	$43 43

I will here remark that the land will be in fine order for two years, without any other manure than a little plaster.

I have engaged a machine at the South for cutting potatoes, turnips, and other roots for sheep. On its arrival it will be free for the examination of any one who wishes to build. I will now close, with the earnest request that our farmers would communicate the result of their useful experiments—it would be beneficial to all. I wish my neighbors would follow Gen. Barnum's example, by freely communicating the information he acquires by experience and by agricultural publications. I believe it is but justice to say of him, that we are more indebted to him than any other man in this part of the country, for the introduction of fine domestic animals, his recommendation of the manner of breeding and crossing the breed of them, and for various other useful improvements in farming.

REUBEN WHEELER.

Ferrisburgh, Sept. 25, 1835.

[From the Cultivator.]

J. BUEL, Esq.

Sir,—Permit me to present to your readers a translation of the story of Lucius Quinetius Cincinnatus. In order duly to appreciate the history of this man, whose name after the lapse of centuries has reached even this western world, it is necessary to be able to peruse it in the simple but inimitable language of the great Roman Historian. There is in the original description a beauty and simplicity which are unrivalled. When Rome was distracted by commotions within, and assailed by hostile bands without—when the army commanded by the consul was besieged even within their camp, and dared not go forth to meet the foe, — when all was confusion and dismay, and destruction seemed to threaten even the city itself, Lucius Quinetius Cincinnatus was appointed dictator by the unanimous voice of the people. The affairs, as recorded by Livy, is as follows:

"Let those listen to the story of Cincinnatus, who despise every thing when compared with riches, and who deem the poor neither virtuous or honorable. Lucius Quinetius, the only hope of the Roman empire in the hour of peril, cultivated four acres of land upon the banks of the Tiber. He was there found by the commissioners despatched for this purpose, while engaged in *ploughing*. Having exchanged salutations, they beseeched him for his own sake, and from his regard for the Republic, to listen to the commands of the Senate. Amazed, and anxiously inquiring "if all was well," he desires his wife Racilia to bring his gown from the cottage with all possible haste. No sooner had he wiped away the dust and sweat, and thrown around him his garments, than the ambassadors, with congratulation, salute him dictator, and invite him to the city, declaring that the army was overwhelmed with terror. In a ship prepared at the public expense, Quinetius and his three sons are conveyed to Rome: his relatives and friends, and all the nobles, go forth to meet him. Surrounded by an immense multitude, and attended by lictors, he is conducted to his future abode. Having met and overcome the enemy, and restored peace to the city, he resigned the office of dictator at the close of the sixteenth day, although elected for six months, choosing to cultivate his humble farm, and abide in his humble cottage, rather than control the destinies of the Roman people."

Let those who cultivate the soil with their own hands, reflect upon the following facts in the story of Cincinnatus. He was a humble farmer—possessed only *four acres* of land—dwelt in an humble *hut* or cottage — was found by the commissioners actually employed in labor — was covered with dust and sweat, the necessary accompaniments of rural toil; and yet even this man, by the unanimous voice of the people, was placed at the head of the Roman empire, with absolute power over the property and lives of his fellow citizens. Having accomplished the object for which he was elected, he most readily and cheerfully resigns his office, and retires to the shades of private life. The name of Cincinnatus will never die; while simplicity and virtue remain on earth, it will stand emblazoned in characters that "can be seen and read of all men."

ONEIDA.

Vernon, June 21, 1835.

IF I WAS HE.—If I was a Farmer, I would devote my whole attention to the cultivation of my farm, clothe and feed my servants well, take care of my stock, mend holes in my fences, take a fair price for my produce, and never indulge in idleness and dissipation.

If I was a lawyer, I would not charge a poor man five dollars for a few words of advice.

If I was a physician, I could not have the conscience to charge as much as they do for feeling the pulse, extracting a tooth, taking a little blood, or administering a dose of calomel and jalep.

If I was a merchant, I would have an established price for my goods, and not undersell or injure my neighbors; I would sell at a moderate profit, giving good weight and measure, and deal as honestly as possible.

If I was a mechanic, I would apply myself industriously to my business, take care of my family, refrain from visiting taverns and grogshops; and when I promised a man to have his work done by a certain time, I would endeavor to be punctual.

If I was a young buck, I would not cut as many ridiculous capers as some do—playing with watch chains, flourishing with their rattans; stamping on the pavements with their high heeled boots, [probably not paid for,] and making remarks on plain and worthy people. They render themselves contemptible in the eyes of the sensible and unassuming.

If I was a young lady, I would not be seen spinning street yarn every day, ogling this young fellow, nodding at another, and giving sweet smiles to a third—sometimes having three holes in one stocking and two in the other.

If I was an old bachelor, I would make every exertion in my power to get married, and if I failed I would buy a rope and hang myself.

And finally, Mr. Printer, if I was one of your useful and respectable profession, I—would never trust my paper in a lawyer's hands, and never refuse publishing a piece like this.

N. B.—If I was a subscriber to a newspaper, more particularly such a valuable newspaper as you publish, I would pay for it like an honest man. If I was not a subscriber, I would subscribe for it immediately, and to save trouble comply with the terms.—[Maine Farmer.]

THE FARMER.—It does one's heart good to see a merry round-faced farmer. So independent, and yet so free from vanities and pride. So rich, and yet so industrious; so patient and persevering in his calling, and yet so kind, social and obliging. There are a thousand noble traits about him which light up his character. He is generally hospitable—eat and drink with him, and he won't set a mark on you, and sweat it out of you with double compound interest, as some I have known will: you are welcome. He will do you a kindness without expecting a turn by way of compensation: it is not so with every body. He is generally more honest and sincere—less disposed to deal in a low and underhand cunning, than many I could name. He gives to society its best support; is the firmest pillar that supports the edifice of Government; he is the lord of nature. Look at him in his homespun and gray back—gentlemen laugh if you will—but, believe me, he can laugh back if he pleases.

FOR SALE,

NEW LEICESTER SHEEP, AND BERKSHIRE PIGS.

A few Rams and Ewes, of pure blood, also Cotswold and New-Leicesters, equal to any in the Union.

ALSO,

A quantity of Berkshire Pigs, (ready for delivery the first week in November next,) directly descended from a part of the Stock imported by S Hawes, Esq., of Albany,—price $5 per head.

A. & G. BRENTNALL.

Hamptonburgh, Orange co. N. Y., Sept. 21st, 1835. 10

APPENDIX

TO THE

NEW-YORK FARMER, AND AMERICAN GARDENER'S MAGAZINE.

We are much obliged to Mr. BEMENT for his prompt reply to our request for an account of his farming, and a description of his stock. Of the latter we can speak in the highest terms. His "Short Horned" cattle are amongst the finest we ever saw, and are well worth a visit of 50 miles to a lover of fine cattle. His sheep and hogs, too, are of a superior breed; and Mr. Bement is always ready to show his stock to his friends or strangers who call upon him; and we may add, that they will be as well pleased with his *table*, (for he keeps a hotel, see his advertisement on the cover,) as with his herds and flocks.

We should be pleased with a similar description of fine stock, or an improved mode of farming from each of our subscribers.

Albany, January 27, 1835.

D. K. MINOR:

Sir,—Your favor of the 24th inst. came to hand last evening, soliciting some account of my stock, experience in farming, &c. Now, I would cheerfully comply with your request were my abilities adequate to the task. My experience in farming matters must necessarily be very limited, for I have only had possession of one since April last, and that one was considered none of the best, having been skinned and fleeced to that extent that it would hardly produce half crops. Notwithstanding the situation of the farm, and the lateness at which my crops were necessarily put in, and the excessive drought, still they were tolerably fair. I cut about sixty-five tons of hay on the same ground that only yielded about thirty tons the year previous. This great difference of product I attribute to the free use of plaster. With the aid of plaster and manure, of which I have a plentiful supply, I am in hopes of doing better for the ensuing season.

My cattle suffered very much in the fore part of the summer for the want of shade, as the skinning had even been extended to the trees, for there are only about five small ones left on about eighty acres! After harvest they were turned into my grain stubble, which had received in the spring a plentiful supply of clover and other grass, seed designed entirely for pasture, with about twenty acres of pine wood, where they improved with astonishing rapidity, notwithstanding the excessive drought the latter part of the season, and went into winter quarters in as good condition as I could wish.

On the first of December I had thirty-one head tied up in my stable, of which twenty-four were of the "Improved Durham Short Horn" breed, consisting of bulls, cows, heifers, and calves, of various ages, and some of them imported. Since then I have sold one cow and calf, one bull, and two heifers, leaving now on hand nineteen head of the Durham cattle. The others were my working oxen, and one cow and calf of the Polled breed.

Having all my cattle in stables, and chained up separately, it has given me a fair opportunity of testing their qualities in keeping, contrasted with our native breed. The stronger has no advantage over the weaker; each animal gets its allowance. The usual allowance for full grown animals is one bushel of cut hay, straw, and corn stalks, mixed with half a bushel of brewers' grains, one half in the morning, and the other half at night, with a little long hay at noon, by way of relish. The smaller animals were fed in proportion to their age and size; and with this feed the Durhams have improved, while the native, (though smaller,) have not held their own. Another circumstance leads to the same result.

A friend of mine wishing to raise a calf from a very superior milker of our native breed, applied in the fall to me to keep her through the winter with my calves, to which I consented. On the first of December she was received at my farm, and put in the stable by the side of my own animals, was fed at the same time, and with the same kind of feed; still she does not grow so fast, and is far behind them in condition and appearance. It is contended by many, that it requires more food to keep the Durham than our native cattle, owing to the greater size, &c. &c. of the former. In answer to this I can only say, such has not been the case with my herd.

I will now, at your request, proceed to give you a description of some of my animals, and begin with

"Carlos," a red and white bull, six years old, got in England by Mr. Whittaker's Charles; dam, Galatea, bred by Mr. Whittaker, and got by Frederick, sire of the "Duke of York," lately imported by a company in Ohio, for which they paid £170 sterling in England, and must have cost them about $800 at the Sciota. Carlos is not large, but beautiful; fine in the head and horns; short and clean neck; deep and broad chest; large round barrel; great breadth of loin; small and short in the legs; fine and silky hair, with a soft and mellow skin.

"Superior," a roan bull, three years old, got by Frederick, a son of Wye-Comet; dam, Yellow Rose. Superior is not large, but very compact and well made; of fine symmetry and form, straight and fine in the leg, remarkably deep and broad in the chest, deep and heavy carcase, straight in the back, and wide across the hips and loin. His stock, though young, promises well. Great prices for some of his calves, from native cows, have been refused.

"Damon," a red and white bull calf, three months old, got by Superior; dam, imported cow Dulcibella. Damon is a calf of great promise, having in an eminent degree all the good points generally found in calves of his age.

"Dulcibella," white, with some red on her head and neck; eight years old; bred in England by Mr. Whittaker; got by Frederick; dam, Delicia. She is a part of my *capital*, from which I expect large dividends. She is a large animal in a small compass; she is of great length, deep, and round in body, immense breadth across the hips and loins, large and capacious chest, brisket dropping within 15 inches of the ground, straight on the back, short neck, and good head; keeps in good condition, and gives a good mess of very rich milk.

"Dorinda" is white, with a red neck and head; three years old; got by Carlos; dam, Dew Drop; granddam, Dulcibella. She is a heifer of good promise, of fine size and form, has had only one calf. A good milker.

"Georgiana," "Delia," "Gertrude," are from ten to eighteen months old; all got by Carlos; and are very superior animals of their age.

The above are all "Herd Book," and high bred animals. My other cattle are all very good, but nothing very peculiar or superior to the others, therefore a description is superfluous.

My swine consist of the "improved China," introduced here by the late Christ. Dunn, Esq., of this city; also, the Berkshire breed, imported and introduced in this vicinity by S. Hawes, Esq., who removed from England, and settled about three miles west of this city. This, I think, is the farmer's hog, for they are of great length, round body, short in the leg, and a little larger bodied than the China; easy keepers; and may, I am informed, be fatted to 5 or 600 pounds! And though last, not least, is a beautiful sow, eight months old—a combination of all the good points that are required in the hog, being long and round in body, short and small legs, short, small head, with very small upright ears, &c., &c. She is one of three that took the first premium at the Berkshire Agricultural Fair, held at Pittsfield in October last. When I applied to the owner to ascertain what particular breed they were of, he said "*They were the best breed he could find.*" They will attain, with ordinary care, at nine months, about 200 lbs., and with a little extra care, 225 to 250 lbs. This sow I intend to cross with my favorite little China.

My sheep are few in number, but some of them very superior, especially the New Leicesters. The others are two South-down bucks, some half blood South-down ewes, &c. &c.

Very respectfully yours,
Caleb N. Bement.

From my Memorandum Book.—I send you, Messrs. Editors, a memorandum of the produce of 36 1-2 acres of land, the past season in grain and grass, not on account of any thing worthy of notice in the result, but that others may profit by my *errors* as well as by my wisdom. The soil is a sandy loam, and no part received but one ploughing for a crop.

17 acres	produced	58	tons of hay,
4 "	"	74	bushels rye,
1 acre	"	2	" wheat,
1 1-2 acres	"	574	" ruta baga,
4 "	"	776	" potatoes,
5 "	"	360	" *sound corn,
4 "	"	87	" barley.

Remarks on the culture.

Hay.—The crop was impaired by the frost of last winter having killed much of the clover, particularly on about three acres I did down last year. Two acres were in a reclaimed swamp, which were cropped with potatoes, in 1833. The wet spring not permitting the ground to be ploughed in due time, and the grass which sprung up spontaneously, promising something of a crop, it was suffered to remain. The product was but *so so.* Three and a half acres were a ley of four or five years, which ought to have been broken up before; as grass, with me, generally diminishes after the third year. The residue bore a heavy crop, and averaged, by estimation, three tons an acre.

Rye.—As it is my maxim to sow this grain either very early or very late, I was obliged to sow late, in consequence of the ground having been encumbered with a potato crop. The product was a fair crop, though I think that if three or four pecks more of seed had been sown on the acre, there would have been a corresponding increase in the product. The grain was good, but thin, the late sown not tillering like that which is sown early.

Barley.—One half of the barley ground was over-manured, and the grain was prostrated before it got into blossom. The product of this part was of course trifling. It should have had no manure, as it followed a crop of ruta baga, well dunged. Besides, it does not answer to have barley ground too rich, or to apply to this crop long manure.

Wheat.—This was sown in February, on ground ploughed in the fall. It promised tolerably well, until it was attacked by the wheat insect, which virtually destroyed the crop. Scarcely a head contained more than three or four kernels, and in some cells, while the grain was standing, I found five and six insects.

Ruta Baga.—This was the poorest crop I ever raised of the kind, and the failure is not attributable to any error of mine, but to the dry summer. It was sown upon an old grass ley, previously pastured, and dunged, ploughed and harrowed just previous to drilling in the seed. The soil was very dry when worked, and there was not sufficient rain afterwards to bring on a decomposition of either the manure or the sod. Comparatively but few of the seeds grew, and the rows were not half filled with plants. In a favorable season, the product would have been more than double.

Potatoes.—Two acres were on a grass ley, well dunged with long manure, and gave a good crop for the season, of more than 300 bushels the acre. This crop received two ordinary dressings, but after harvest I caused all the weeds to be pulled up, and carried to my cow-yard, which, I am confident, added very greatly to the potato crop. One acre was planted on ground habitually wet, and which had been undrained late the preceding fall. The ground was but imperfectly ploughed, the crop was badly tended, and the product was hardly worth gathering, even in this season of scarcity. The fourth acre was principally on ground where barley had been seriously injured by the frost of the 15th May; it was planted late, with refuse seed. The ground was very dry, and from late planting, bad seed, and a very dry season, the product did not exceed 100 bushels. My practice is not to earth potatoes after the tubers have begun to form, as earthing them is apt to cause a new set of stolens to start near the surface, which rob the elder ones of their food, and produce potatoes only of a diminutive size. Yet weeds ought to be carefully extirpated, as they not only impoverish the soil, but shade the ground to the great prejudice of the crop. The labor of extirpating weeds is amply repaid in the increased product. I think I am warranted in saying, that a clover ley, and long manure, the latter well spread and ploughed under, are admirably adapted both to the corn and potato crop.

Corn.—This and the unproductive acre of potatoes were grown in a field abounding in springs, and heretofore habitually wet, but which was underdrained the preceding autumn. A part of the ground had been in pasture, and a part under tillage, and the whole well manured. The hills were planted three by two and a half feet apart, and there remained after the first dressing, four spears in almost every hill. The corn was dressed with the harrow and cultivator, and twice hoed, though but very slightly hilled. Four-fifths gave an uncommon fair crop. Sixty-three selected ears gave a half bushel of shelled grain, averaging more than a half pint each. The other fifth was killed by kindness, or rather from want of personal attention. Having two loads of horn shavings and crushed bones, I directed them to be spread on *two* acres; but my men being unacquainted with these materials, and not appreciating their strength as a manure, thought to do me a kindness, and applied the whole to *one* acre. The consequence was the stalks were too luxuriant and tender, and the wind prostrated them flat to the ground ere the grain was half grown, and but very little of the corn was fit for the crib.

At present prices, the products I have enumerated are worth about $1,300, and average about $36 to the acre.

The errors in my practice, against which I would guard the reader, are—

1. In sparing grass lands from the plough after the cultivated grasses have mostly run out, and after the product has materially diminished.

2. In sowing *late* rye too thin.

3. Applying manure to a barley crop, the soil of which was already rich enough—particularly long manure.

4. In planting potatoes too late, and with bad seed.

5. In the excessive and wasteful application of bone and horn manure. And finally,

6. In not superintending personally all the operations of the farm. We may hire men to *work*; but it is difficult, as my friend Delavan observes, to hire men to *think correctly.*

By way of postscript, I will remark, that I had made, in 1833, in the six acre field in which I grew my corn, about two hundred rods of brush and straw underdrains, which cost me about $20, and that I think I am fully remunerated for this outlay in the *increased* product of the field the past season. J. B.—[Cultivator.]

We would ask for the following, which we take from the Genesee Farmer, an attentive perusal. It relates to a subject becoming daily of more importance, and should be better understood. We ask attention also to the able essay read before the Highland and Agricultural Society of Scotland upon the same subject, from the December number of the "Edinburgh Quarterly Journal of Agriculture." We shall, at our convenience, give another from the same work, upon the same subject, which cannot fail to be useful to some of our readers.

Live Fences.—From an article on this subject in the January number of the Cultivator, we select the following:

The subject of live fences is one of increasing importance to the agriculture of our country. We have many champaign districts of choice land, particularly in the west, and independent of prairie tracts, where there is not likely long to be a reservation of much timber ground, and where there is few or no stone to construct fences. In those districts fencing materials will soon become extravagantly high, and the inhabitants seem to be threatened with the alternative of either dispensing with enclosures, as in France, or of resorting to live fences, as in England. The latter is decidedly preferable, not only to open fields, but to dead fences, unless in districts where fencing materials are abundant and cheap.

Caleb Kirk, of the state of Delaware, a man of the highest reputation for veracity and practical knowledge in husbandry, published some years ago, in the American Farmer, several numbers on hedging, in which he gives the result of nearly twenty years' successful experience. In 1819 he states the actual cost of 1,000 feet of an efficient hedge fence, as follows:

1,000 plants, planting and care first year,	$8 50
Dressing and care of plants 6 years following,	5 00
Expense 7th year for stakes, splashing, &c.	11 25
Expense 6 following years,	4 50
Total expense for 13 years,	$29 25
The posts and rails for 1,000 feet of fence are stated at	75 00

Showing a gain in favor of the live fence of $45 75 in the 13 years, besides the advantage of the live fence being permanent—as good as new—while the dead fence would have gone to decay, and required a new expenditure to rebuild it. In 1832, when Mr. Kirk's judgment had been corrected by four years' further experience, he says, "I find that forty cents a rod will complete the raising to a mature age, and one cent a rod will fully maintain forever after, if duly attended to, and applied with judgment. No failure has ever appeared, except some local cause is present; therefore durability is now well established."

If by "hedge thorn" is meant the English hawthorn, (Cratægus oxyacantha,) our de-

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*My *first* corn and small potatoes, and some pumpkins, have fatted about 2,500 lbs. of pork, *finished*, during the last ten days, with *hasty pudding.*

cided opinion is, that it will not answer in Ohio, as it does not do well here in a latitude nearly parallel. We have given it a fair trial, and after patiently nursing it seven years, abandoned the hope of success, and dug up a hedge row of nearly a half a mile of it, and substituted other plants. Neither our summers nor our winters seem suited to its growth and preservation. The yellow locust is wholly unfit for hedges, from the fact that it produces innumerable sprouts from its roots, which would disfigure the hedge, and seriously encroach upon the fields. Yet we do not know of a tree which it would be more valuable to plant upon the western prairies for wood and timber, than the yellow locust. The growth is rapid, it propagates itself, and it affords a valuable material for fence posts, mill works, and ship building. It will attain a maturity fit for these purposes in twenty-five years from the seed. But the thorns of our country afford excellent materials for live fences, particularly in the districts where they are found growing naturally. This we state as well from personal experience and observation, as from the information of others. In the middle states we have seen good hedges of the Virginia and Newcastle, or cockspur thorns, and we have a promising hedge composed of several indigenous kinds, gathered from the woods and pastures. But the great difficulty is in managing our hedges well. Our own people have as yet but little practical knowledge on the subject, and too many of the foreign laborers, who profess a knowledge on this subject, are mere quacks at the business of managing them. Besides, our climate differs from that of Great Britain, and demands a different culture from that which succeeds there. We have more cold, more heat, more drought. The ditch and bank will not do here, nor is it desirable that it should, as it causes a waste of ground, is unsightly, and is too often a nursery for noxious weeds. A bank and ditch require a width of eight or ten feet, while a simple hedge does not occupy more than two or three feet.

It is believed all the species of native thorn will answer for hedges, as well as many others of our native shrubs and trees. The Bostonians speak well of the buckthorn, though we have never seen it assume any thing more than an ornamental appearance—nothing like a barrier to cattle. We have planted the honey locust, (Gleditschia triacanthos,) as a material to experiment upon; and so far our confidence of success remains unimpaired; though we are not yet prepared to speak with confidence of the result. The best evidence of our confidence in it is furnished by the fact that we have now a mile or two of hedge row of the plants growing, planted in four or five successive years. The principal fear is that it may grow too large, an objection which will not apply so forcibly in Ohio, where land is abundant, and where the level nature of the country renders shelter desirable in winter. Yet we think, from our manner of training, the nearness of the plants, and by careful attention to clipping, when the growth of the hedge requires it, we can keep it within reasonable bounds. The honey locust, when cut in, does not throw out numerous shoots, like the thorn, but the principal growth is confined to a single stem. Our remedy for this defect is, to bend down and lay in the plant at a uniform height, when the stocks are from one to two inches in thickness, and to repeat laying the new growth every second or third year till the horizontal barrier is four to five feet high. The tops are wattled to the right and left alternately of the adjoining plants; and if the top is not depressed below a horizontal position, it continues to live and grow, and sends up shoots from nearly its whole length. The hedge of course becomes firmer and stronger every year.

We will close our remarks by advising Mr. Lockwood and his neighbors to collect, without delay, haws or seeds of the indigenous thorns of their neighborhood, and seeds of the honey locust, which we believe is a native of their forest, and to sow them in the spring in beds of good earth. The first will not come up till the second year, and many seeds of the latter will not germinate in a shorter time. Keep the seed beds free from weeds, and after two years' growth, the plants will be fit to put in a hedge row. They may also collect in the spring from the woods plants of the thorn, of any moderate size, say from the eighth of an inch to two inches thick, saw off the tops near the roots, and having prepared the ground well, make a trench on the site of a desired fence, and plant the roots one foot apart.

[From the Prize Essays and Transactions of the Highland and Agricultural Society of Scotland.]

ESSAY ON RAISING AND MANAGING HEDGES.—In 1833, the Society, considering the subject of Live Fences as one of much importance, offered a premium for an approved Essay, founded on experience, on the manner of raising and managing hedges, and on the kinds of live fence suited to differences of soil, climate, and modes of occupation. Candidates were required to detail the manner of forming the mound, ditch, and other parts of the fence; the proper period of planting, the price of the plants, the prime cost of wood for rails, and the expense of sawing and putting up the rails; together with the subsequent management. They were also required to state the different kinds of plants adapted to live fences, and suited to differences of situation, soil, and climate; to explain the advantages and disadvantages of a mixture of plants; and to offer suggestions regarding the means of improving the state of the fences of the country. Three Essays were received, to the authors of which premiums were awarded, and of which a condensed account is here presented. It is unnecessary to offer any remarks on the respective merits of these essays, and the different modes recommended, as each of them is given in a tolerably detailed form.

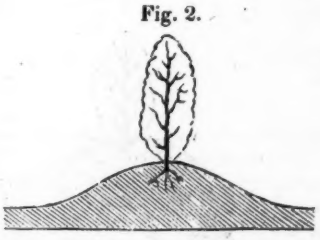
Essay I. By MR. MONTGOMERY, Buchanan House, near Drymen. — Various plans are in use for raising hedges. The first is, to plant the hedge on an even surface; the second, to place it on a raised surface; the third, to form a ditch, and to plant the hedge at the surface in the side of the ditch; the fourth, to form a mound, and plant the hedge in the middle of it; the fifth, to plant a hedge on each side of the mound, thus forming a double fence; the sixth, to build a sunk wall, or to form a sloping cut, and to plant the hedge at the top of the wall or cut.

The first method, that of planting a hedge on an even surface, is represented by Fig. 1. The line being marked out, the ground should be trenched, one yard and a half wide, and eighteen inches deep; and when of bad quality, it should be improved, by adding good earth. This part of the work may be done at any time of the year. When you are going to plant your hedge, make an even downward cut with the spade the length of the line, along the middle of the trenched ground, and lay it upon one side. When this is done, drop your plants

Fig. 1.

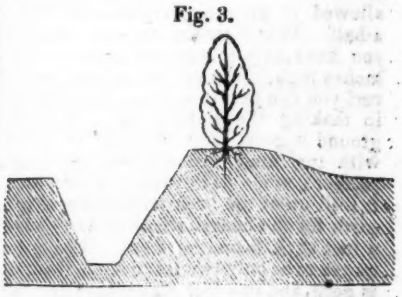
along the line, in the order in which they are to be planted, and plant them neatly to the side of the cut, placing them three or four inches apart, according to their size. When they are fixed along the line, let the mould be properly trodden to their roots; then dress the ground to the hedge. This sort of hedge requires a strong railing to be kept up, until it become effective as a fence.

Fig. 2.



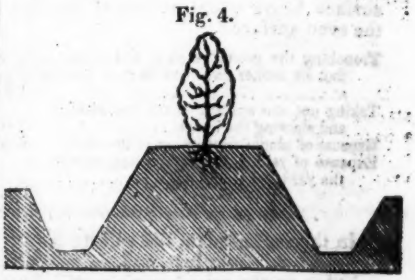
The second method, although similar to the first, is yet, in my opinion, preferable, on account of the surface being raised a foot high in the middle, as shown by Fig. 2. You prepare your ground as in the first plan, but observe to throw as much mould from the sides as will raise it to the height in the middle. Then plant the hedge as above. A four feet hedge will be as good a fence on the raised surface, as one of five feet on even ground, and the expense is nearly the same.

Fig. 3.



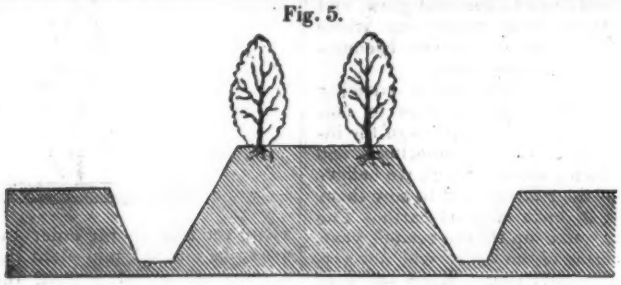
The third plan is the usual method of making a ditch along the line, three feet inside at the surface, nine inches at the bottom, and two feet and a half deep, all the earth being thrown on the side of the ditch on which the hedge is to be planted; it being usually placed near the surface of the ground, at the edge of the ditch, as shown by Fig. 3.

Fig. 4.



The fourth plan is to form a mound two

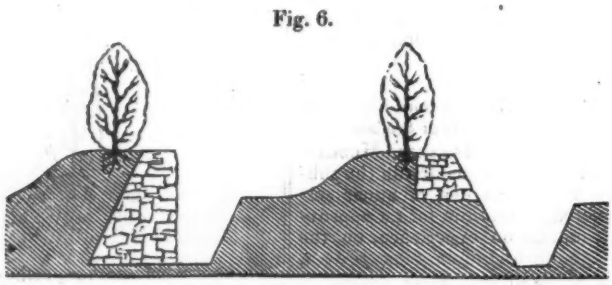
Fig. 5.



feet six inches wide at the top, five feet six inches at the bottom, and three feet high, the hedge being planted in the middle of the mound, as shown by Fig. 4.

In the fifth method there is a mound, with a hedge planted on each side, as shown by Fig. 5, the mound being three feet six inches wide at the top, six feet six inches at the bottom, and three feet high.

Fig. 6.



The sixth plan, Fig. 6, is to have a sunk wall, two feet nine inches in height, two feet wide at the bottom, and ten inches at the top. The wall should be perpendicular in front, having the slope all at the back, from the bottom to the top; the back should be well packed or built, filled with good earth, and the hedge planted close to the top of the wall. This, in my opinion, is the most efficient fence, and in the end the cheapest. The hedge should not be allowed to grow higher than two feet and a half. When stones are not easily got, you have only to use turf a foot or nine inches high, if the ground is good, and this turf you can get from the surface you move in making the sloping cut. Where the ground is good, raise the wall or building with turf nine inches above the original surface; when poor, raise it a foot, and fill it well up at the back with the best of the earth for the hedge, which is to be planted a foot back from the front. The cut requires to be only two feet deep if the ground is good, and one foot nine inches deep when it is poor.

The next thing to be considered is the expense of executing the work in the different ways. According to the first two plans, where the ground can be worked with the spade, the expense is nearly equal, as the additional work in raising the surface in the second plan is balanced by the expense of staking being less than in the first, a stab or stake four feet long on the raised surface being equal to one of five feet on the even surface.

Trenching the ground a yard and a half wide, one foot six inches deep, can be done per lineal yard at	£0 0 1½
Taking out the spading along the middle, and planting the hedge	0 0 1
Expense of plants, nine or ten to the yard	0 0 2½
Expense of railing, five-feet stakes, two to the yard, rafter and nails	0 0 2½
Amount per lineal yard	£0 0 7½

In the second plan, the railing requires a stake of only four feet, and, in my opinion, a hedge on the raised surface will become a fence two years sooner than one on the even surface. There is also one-fourth less expense in the annual dressings. The cause of this is obvious, as a hedge on the raised surface is as good a fence three feet high, as a hedge of four feet on the even surface.

Expense of trenching and raising the ground per lineal yard	£0 0 2
For plants and planting the hedge	0 0 3½
For four-feet stakes, two to the yard, rafter, nails, and putting up	0 0 2½
Amount per lineal yard	£0 0 7½

In the third plan, or the common way of a ditch and a hedge on the side, the usual way is, when the ditch is cut on each side, to take a good turf, and lay it with its grass side downwards, on the side of the ditch where the hedge is to be planted. Lay the turf to fit the slope of the ditch, the slope to be six inches in the foot. Then plant your hedge, nine or ten plants to the yard, with the tops of the plants even with the slope of the ditch, on the top of the turf, putting the good surface-mould to the roots of the plants, and throwing the rest of the earth that is taken out in forming the ditch to the back of the hedge. This method of planting the hedge I do not approve, for the following reasons. The first year the hedge looks likely to succeed, but the second year the frost during the winter loosens the earth about the roots, when much of it falls down into the ditch, and the roots of the hedge become exposed, and are injured by the dry weather in summer, so that the hedge makes little progress, and becomes stunted in its growth.

Expense of forming the ditch, as shown by fig. 3, per lineal yard	£0 0 2
Expense of plants, and planting the hedge, 9 or 10 to the yard	0 0 3½
Three-feet stakes, rafter, nails and putting up,	0 0 2
Amount per lineal yard	£0 0 7½

According to the fourth plan, you begin with a surface three feet and a half wide, building up the sides with turf a foot high on each side, and sloping six inches in the foot, which will make the top of the mound two feet six inches wide; and on each side make the sloping cut two feet high, which makes the mound five feet six inches wide at bottom. The good earth moved in making the sloping cut is to be thrown into the mound, in sufficient quantity to allow for subsiding.

Expense of forming the mound per lineal yd.	£0 0 2½
Do. of plants and planting along the middle of the mound	0 0 3½
Do. of stakes of two feet six inches, rafters, nails, and putting up	0 0 1½
Amount per lineal yard	£0 0 7½

The fifth plan being somewhat similar to the fourth, only having a double hedge, will require three feet six inches of width at the top, four feet six inches at the surface, and six inches at the bottom. The sloping cut on each side is shown by fig. 5.

Adding 2½d. per lineal yard to the expense by the fourth plan, that of the present will amount, per lineal yard, to	£0 0 9½

I would here observe, that the single hedge planted in the middle is the most advisable, and in my opinion the best fence. I would by no means recommend the mound-fence in dry ground, as in that case the mound will get into a state of aridity, and the plants will not grow. Furze may answer in such a case, but nothing else. I certainly give the preference to the mound with the hedge in the middle, it being the least expensive, the least troublesome in its management, and the more certain of the two to become a good fence.

The plan shown by fig. 6 is the sort of fence which I would particularly recommend as the most substantial and efficient for inclosing ground for planting, and in every respect the most effectual in the shortest time, and attended with the least expense in the management after being planted.

The expense of the first method shown by fig. 6, or when built with stone in front, is as follows:

For building and sloping the ground, per lineal yard	£0 0 6½
Expense of plants and planting the hedge	0 0 3
Railing stakes two feet, rafters, nails, and putting up	0 0 1½
Amount with stone facing, by the sixth plan,	£0 0 11

When the side is built of turf, the expense is as follows:

For building the side, and sloping the ground, per lineal yard	£0 0 2
Expense of plants and planting	0 0 3
Railing 2-feet stakes, rafters, and putting up,	0 0 1½
	£0 0 6½

The last plan with turf, as shown by fig. 6, is the cheapest in putting up, but that with the wall in front is the best. The great advantage is the planting of the hedge a foot back from the front, at the top of the building with stone or with turf. This allows the hedge to have a plentiful supply of moisture at the root, without being injured by the changes of the season. The railing is less expensive, as the hedge will become a fence in half the time required for the first and second methods, and the hedge in either of the last two plans being a good fence when two feet high, whereas, by the first two plans, it will require to be four feet high.

The mound-fence, with the hedge in the middle, would, in favorable situations, be a good fence in the same period as by the last methods; but there are few situations that suit this mode of fencing, for the reasons already stated.

I have now to speak of the different sorts of plants used in making fences. The following are the kinds respecting which the

society demands information, with their prices per thousand.

Hawthorn,	*Cratægus oxyacantha*,	20 to 24 inches high..... 8s. to 10s.
Beech,	*Fagus sylvatica*,.....	15s. to 20s.
Hornbeam,	*Ostrya vulgaris*,.....	15s. to 20s.
Birch,	*Betula alba*,.....	15s. to 20s.
Holly,	*Ilex aquifolium*,.....	50s.
Furze,	*Ulex europæus*,.....	15s. to 20s.

To these may be added,

Yew,	*Taxus baccata*,.....	100s.
Evergreen Privet,	*Ligustrum vulgare*,.....	15s.
Elder,	*Sambucus nigra*,.....	30s.

The thorn, hornbeam, holly, and yew, are raised from seed, generally sown in autumn; the beech and whin are sown in spring; the evergreen privet and elder are raised by cuttings four or five inches long, planting them in the ground early in March, in rows of a foot between, and three inches in the row. More sorts might be added, but the above are those most approved of for live fences.

The hazel, birch, and whin, I do not hold in much estimation, whether used singly, or mixed with others. The two first do not repel cattle, and sheep destroy the whin in winter, nor would it mix with other plants to advantage. The birch is too pliant when young, the hazel grows too open and large in the leaf to mix, and in my opinion none of these should be used in live fences.

The thorn, the holly, and the yew, are well known, and require nothing to be said in their recommendation. The beech, hornbeam, elder, and evergreen privet, are particularly suitable for mixing in live fences, and are also long-lived plants.

Those which I would most recommend for being generally useful as fences, are the thorn and evergreen privet, the elder and evergreen privet. When the hedge is of the first two, let the proportion be two plants of thorn to one of privet; when of elder and evergreen privet, let the number be equal; when of thorn and beech, let there be two of the thorn to one of the beech; and when of thorn and hornbeam, let them be alternately planted.

The thorn and hornbeam, the thorn and beech, the elder and hornbeam, and the elder and beech, make good hedges, and have a reddish appearance during winter. The evergreen privet, mixed with thorn or elder, makes a very good hedge, and has a beautiful olive green appearance during the winter, when dressed in proper time in summer. Therefore I consider it the best plant to mix with the thorn, or with the elder, as the cattle do not eat it so readily, nor have I seen it infested with any sort of insect. The leaves being small, are not injurious to the hedge; the roots are also very numerous, and soon fix the mould at the surface, so as to prevent it from falling away from the hedge, or tumbling down into the ditch.

Hedges should be cut or dressed in the middle of summer, and the usual way of dressing them only in winter is very objectionable, the growth of the hedge being, as it were, lost; from being allowed to grow at the top all the season, it becomes there luxuriant, while at the bottom very little progress is made, and in a few years it becomes quite naked below. By cutting the hedge in summer, an equal growth is produced all over, from the bottom to the top; and by the second growth its closeness is increased, and the hedge greatly improved. The dressing should take place from the 20th of June to the middle of July, according to the advanced growth of the hedge. By attending to this plan of dressing your hedges twice in the year, you would do them in much less time than would be the case were you to allow them to grow on all the season without cutting.

The season for planting hedges is often too little attended to, such work being left until spring; but the proper time is when the leaf begins to drop from the young thorns. I recommend planting hedges in November and December, and not later than February; for then the juices begin to circulate, and cutting the roots after that period allows the sap to escape, and thus retards the growth of the plant the first season. The hedge ought to be planted, as recommended, with well selected plants, from twenty to twenty-four inches high, and two years transplanted. They are to be cut down to twelve inches, and if properly planted will make fine strong shoots the first year, which should not be cut until winter, when the hedge is to be dressed in the wedge form to 18 inches high. After the first year dress your hedges in summer, and in the end of the season, increasing them gradually to the height required.

When the hedges are well managed, those at the top of the sunk wall, or building of turf, as shown by fig. 6, will be a good fence the third year; on the raised surface in four years; and on the even surface in six.

On the subject of weeding the hedges and cleaning the ditches, a great deal might be said, were I to follow the ordinary practice; but the method which I recommend is simple, and requires few words. When your hedge is planted, sow on each side of it white clover seed, to the breadth of from two to three feet, as early as you can in spring; and once or twice during summer cut the grass with a short scythe, or a grass hedge-hook. If thistles, docks, or other strong weeds, rise, remove them; but never dig about your hedges, unless you are going to add plants. Let the grass be kept down two or three feet out from the hedges, and dress them as directed.

Ditches require very little cleaning, if made according to the plan recommended above, once in two years being enough, and the expense trifling. When the side your hedge is on is well sloped, there is little falling down, and on the opposite side, sloped away from the bottom of the ditch, there is very little filling up, so that, in most situations, the business may be done for less than a halfpenny per yard.

When you put up your railing to serve as a fence and as a protection for the young hedge, particularly in the case of that planted on the even or raised surface, in the division of fields, with cattle occasionally grazing on each side, I would recommend to put the stakes alternately on each side, one foot six inches out from the hedge, driving them sloping, so as to project six inches over the hedge, they being four feet or four feet and a half long.

For the other fences, stakes two feet or two feet and a half long, are sufficient. Drive them into the ground at the distance of one foot from the hedge; and in putting up the railing, drive the stakes on one side first, nailing the rafters two inches from the end of the stakes, making the rafter to be exactly over the top of the hedge. When this side is finished, drive the stakes on the opposite side, making them to rest on the rafter, and project two inches over it.

When hedges require to be protected on one side only, make your railing accordingly. For the sunk wall and hedge, or building with turf and hedge, use stakes two feet long; drive them into the ground six inches, and four or five feet apart, sloping so that the top-rafter will be even with the outside of the wall or turf, and let another rafter be half-way between the top-rafter and the turf or wall. Such protection for the fence will be found a sufficient fence for repelling sheep or black cattle, on either of the last-mentioned plans, until the hedge is an efficient defence of itself, it being observed to bring the hedges in the cutting, as soon as it can be done, even with the front of the turf building or wall.

I subjoin the prices given for making stakes of different sizes, and what they are sold at for ready money, together with the price of rafters.

	Charge for making stakes per 100.	*Charge for made stakes per 100.*
Stakes, 5 feet long,	£0 1 4	£0 3 0
Do. 4½ do.	0 1 2	0 4 6
Do. 4 do.	0 1 0	0 4 0
Do. 3 & 3½ do.	0 0 9	0 3 0
Do. 2 & 2½ do.	0 0 7	0 2 6

Charge for sawing rafters 2½ in. by ¾ in. and 37 yards long..... £0 0 4½
Do. for made rafters..... 0 2 0

[From the "Mechanics' Magazine and Register of Inventions and Improvements."]

AMERICAN INSTITUTE.—We are permitted to publish the introductory lecture delivered before the American Institute on the 8th ultimo, by T. B. WAKEMAN, Esq. It gives an account of the origin and object of the Institute, and enumerates a few of the many important benefits which have resulted from its establishment. It is worthy of an attentive perusal by every practical business man; and no one, we think, can read it without deriving benefit therefrom—certainly not without being instructed and pleased.

Introductory Lecture delivered before the American Institute of the City of New-York, the second Thursday in January, 1835.

THE duty of commencing a series of lectures before the members of the American Institute has been assigned to me. It was an unexpected honor—an honor for which I feel grateful. And were I capable of doing justice to the occasion, it would be one of the proudest circumstances of my life. But while I feel conscious of my inability to *say* what *ought to be said*, I am at the same time satisfied that, as an early and devoted member, every indulgence will be extended to me, and that my sincerity in the cause will afford an ample apology for every imperfection.

It is difficult duly to appreciate the bearings, influence, and extended importance of this association—the American Institute—intended not to be limited to a single state, nor to any great section of our country, but a national establishment, whose influences are designed to be spread to the utmost boundaries of our republic. Located in the city of New-York—the heart of the nation—a place of all others calculated, under proper direction, for a great, powerful, and eminently useful institution, capable of extending its benefits, not only to the present inhabitants of these United States, but to future generations.

The charter under which we are authorized to act, was granted the 2d of May, 1829. It is to the members a

perpetual bond, sanctioned by the supreme power of the State. The objects intended to be accomplished through your exertions, and instrumentality, are plainly recounted. They are as follows—"for the purpose of encouraging and promoting domestic industry in this State, and the United States; in agriculture, commerce, manufactures, and the arts, and any improvements made therein, by bestowing rewards, and other benefits on those who shall make any such improvements, or excel in any of the said branches, and by such other ways, and means, as to the said corporation, or the trustees thereof, shall appear to be most expedient."

The association is also empowered to make By-Laws for the purpose of carrying into effect the objects just quoted. The legislature intended to cover the broad ground of political economy. They foresaw the vivifying influences, which, under able management, such an institution must exert, on invention, the arts, and industry in general. They foresaw the knowledge it was calculated to gather and diffuse. Time has already, partially, verified their anticipations. But much remains to be accomplished.

And here the questions naturally present themselves,—what has the American Institute already done, and to what purpose have these ample powers, conferred, been exerted? And 2d, what further remains to be done?

Among other things which have grown out of this Institution, since its organization, are the written and printed communications, either voluntary or prompted, from individuals and scientific institutions. The practical and learned managers of the Royal gardens in Italy, and some of the most distinguished philosophers in France, have favored us with the fruits of their researches and experience. Practical individuals and affiliated institutions, in our own country, have aided—their rich contributions have poured in, for our gratification, and instruction.

At our stated and other meetings, a great variety of reports have been made on subjects intimately connected with the prosperity of the country—on cotton cloths, and yarns, on silks, oil cloths, glass, and cabinet wares, and ship building, on the manufacture of leather shoes, and on the cultivation of indigo, cash duties, &c.: embracing a great number of facts, collected with persevering industry, and arranged with skill and care. These reports have excited discussions, among the members. These discussions have elicited ideas which would have laid dormant forever. The advantages, springing from such discussions, are of inestimable consideration.

The human mind is incomprehensible to itself. Ideas, in their dormant condition, are as valueless as nonentities. And the mind, in an unexcited state, is as unconscious of their existence, as the flint is of the fire it contains; when heated, and brought into action by discussion, thought creates thought—and ideas succeed ideas, the mind knows not how—and the debater is often amazed, at the fertility of his own conceptions, and the creative powers of his own invention. Many of the reports, made to the Institute, were intended to fortify the necessity of the protective system. A powerful and dangerous foreign influence had been exerted in this country, against governmental protection.

For some time previous to the incorporation of this Institute, the British press had continually teemed with pamphlets and publications, intended only for exportation, (for they were never practised upon at home,) filled with hosannas to free trade.

They recommended, with all the ardor of sincerity, a most amiable reciprocity—an unrestricted interchange of the commodities of all climes, and all countries—at the same time that they clung with scrupulous tenacity to their own enactments, that excluded from *their* markets, any, and every article, produced within the limits of their wide spread empire. Their pretended relaxations were generally so graduated, as not to impair an iota of their restrictive policy; or if a single exception was permitted, it was under stipulations which gave them decided advantages, and strengthened their gigantic monopoly.

The syren sounds of free trade, perfect reciprocity, and the painted commercial millenium in perspective, deluded some, vast numbers, from hopes of gain; and others, for political preferment, rallied round the free trade standard. They contended that the expediency of pursuing manufactures in this country must be tested by their ability in their infancy, to compete with establishments which had been nurtured into existence, and grown and strengthened for ages. The apprentice was required, on his first entrance into the workshop, to do more than the duties of an accomplished journeyman—for we had, in many branches of manufactures, every thing to learn, and were wholly destitute of even the necessary tools.

These suicidal doctrines, aimed at the vitals of American industry, were repelled by facts, analogies, and arguments contained in authentic reports read to this Institute, that never have been refuted. These reports show that our mechanical and manufacturing establishments have uniformly flourished under the fostering influence of protection. The application of this stimulus brought capital, skill, industry, and economy, into operation, and the consumer was soon supplied with a cheaper and better article. The reports name the exact prices of particular articles, from an early period of our country's history, down to the present time; and they also note all the intermediate advances of our tariff, thereby demonstrating as far as facts and analogies can demonstrate, that increased protecting duties, at every successive stage of their increase, have conduced to reduce prices, and benefit the consumer; and at the same time promote the general prosperity, by enabling *all* to obtain the comforts of life, with greater facility, and with less toil, than before. There is a remarkable uniformity, as exhibited in these reports, in the decline of prices at each successive advance of the tariff of duties. Facts likewise show, that the prices of those articles which have not received the favor of protecting laws, have, to a great extent, and with remarkable uniformity, *maintained* their prices; or if they have declined in prices, their decline has not been at all proportioned to the decline on those articles which have been fostered *by* protection. Home competition has not been brought to bear upon them: our home supply, in the absence of protection, has been obtained from abroad, and accordingly in the absence of protection, and consequent competition in production, *here*, the foreign producer has been enabled, in a great measure, to affix prices in accordance with his own interest. If there are any exceptions, those exceptions are shown to arise from some peculiar qualities in the articles themselves, not attendant on ordinary cases—such as bulkiness, liability to breakages, being of a perishable nature, or subject to injury from sea voyages, or some other causes,—which, in effect, gives to the American manufacturer, a palpable advantage over his foreign competitor, and in their influences afford a substitute for governmental protection. These reports have all been published, and circulated far and wide, and at a time when heterodox doctrines were gaining ground, and no doubt have had their influence in rescuing our manufacturers from the destruction that was designed for them. The public addresses which we have witnessed at our annual public exhibitions, by distinguished individuals from other states, afford specimens of oratory and talent of the highest order. They are masterly efforts, in favor of encouraging American industry. The principles of protection are happily elucidated and enforced. They are replete with facts and documents, showing, among other things, that one of the paramount objects in forming the constitution of the United States, was the protection of American labor against the sweeping rivalry of older nations. That protected labor must form the only firm and durable basis of lasting independence. They all breathe the purest spirit of patriotism. They were delivered to crowded audiences, they have all been published, and republished, and distributed to every part of our country.

The efforts of the Institute have not been confined to the collection of facts, and to the induction of principles; they have labored to advance the cause of domestic industry by other and more direct means: by procuring, and distributing, gratuitously, large quantities of the White Mulberry Seed for the culture of Silk.

The merit of proposing this subject, and much of the praise due to the labors attending the reports produced before the Institute, the procuring and distributing of the mulberry seeds, and experiments on the silk-worm, in justice is due

to our deceased friend, and late fellow laborer, Doctor Felix Pascalis.* A passing notice of the prominent characteristics of this venerated man, who has so often met us, and so often entertained and instructed us, it is hoped will not be unacceptable. It falls to the lot of few men, of any age, to have the opportunity, industry, and capacity, to encompass such a mass of learning as was encompassed by Dr. Pascalis. Moral courage, and enduring perseverance, however, were the distinguishing characteristics of his mind. Thus qualified, he early enlisted as a combatant against error and imposture, and in favor of those objects of utility, which he believed would conduce to the comfort and happiness of man. In such a cause he did not hesitate to jeopardize every thing. At one period of his life you might have seen him in his native France, in possession of a benefice, surrounded with friends, and with an ample income, that supplied him with every comfort his desires could suggest. "The road to power and wealth lay open before him." He at the same time could not but witness the detestable impostures and corruptions of the church. At the risk of independence, and all his flattering prospects, he manfully came forth and exposed them. As might have been expected, he fell a victim to their fury, and was formally excommunicated. Had he truckled to corruption, he might have revelled in luxury. His moral sense revolted, and his courage defied hosts of venal slaves, whose consciences yielded to the unprincipled biddings of a depraved hierarchy, and who joined in proscribing him. He brought with him to America the same fearless spirit—the same inherent desire to do good. Soon after his arrival he encountered that dreadful scourge of our populous cities—the yellow fever. An idea prevailed that it was contagious. Friends and relations were abandoned to suffering and death. Doctor Pascalis, believing it was an error, at the risk of his life, tried experiments, among the dying and dead, in all the perilous shapes and ways that could be thought of. The result afforded abundant proof, in his mind, that yellow fever depended on local causes, and that the masses of putrifying bodies in our graveyards, situated in the midst of our dense population, were a principal cause of its prevalence here. He did not hesitate to encounter the prejudices of the ignorant, or the power of the rich, by his efforts in preventing the burials, and by continued perseverance in explaining and enforcing its importance to the health of the city. His theory eventually prevailed, and, conformably to his often repeated predictions, our city has escaped this awful visitation.

In the early stages of this Institute, when it was pronounced by some, "a small tariff concern," and by others "a humbug," Doctor Pascalis applied to become a member. His first efforts were directed to the production of silk. From the groves of mulberries in his native land, he had often, with his own hands, gathered the foliage that sustains the worm. He knew the importance of commencing at once in procuring the aliment on which they exist. Accordingly, at the first meeting of the institution, after the adoption of a constitution, before its incorporation, (March, 1828,) he introduced a resolution on the subject of silk, and in June following a regular report was made, and a permanent silk committee was constituted. The July following, the committee recommended the importation of a large quantity of white mulberry seed from France, which was approved, and by the agency of Doctor Pascalis, who had previously been made an honorary member, large quantities were imported at the expense of the Institute. At a meeting on the 4th of December, 1828, their arrival was announced. An address to the public was prepared on the subject and published. The seeds were gratuitously distributed, sufficient for many thousand trees. From these seeds innumerable mulberries are growing in many parts of our country. In 1828 he also procured from France three flourishing Chinese mulberry plants, of great value, the first ever imported into this country. They had been introduced into France the year before. From these plants, and others obtained soon after, for Mr. Parmentier, they have been multiplied almost beyond credibility. And thus the way is prepared for the raising of silk-worms to an incalculable amount. The necessary incipient steps have been taken towards the manufacture of that precious commodity which every year drains our country of so great a proportion of her annual earnings. The subject of silk, as our journals show, occupied the attention of Dr. Pascalis, from that period until July, 1833, when his useful life terminated. His experiments, showing the effects of electricity on the silk-worm, were highly complimented in the French journals, and his two volumes dedicated to the American Institute, on the mulberry, and the raising of silk-worms, are permanent memorials of his accurate knowledge of the subjects on which he has written. To his learning and industry the Institute is indebted for much of its celebrity, and the country is under *deep* obligations to him for having given an early impulse to a branch of industry in which the whole nation is *deeply* interested. The exhausting effects of our heavy importations of silks demand some immediate and powerful corrective. Twenty-nine million two hundred and twenty-six thousand eight hundred and four dollars of the hard earnings of our citizens were paid to foreign nations for foreign silks alone, in the years 1831, 1832, and 1833.

The produce which can be spared for exportation, by all the hard-working farmers in all the northern and middle states, will not more than balance our silk account. It is true, that a portion of these silks are exported; but after deducting the amount exported, which will average $1,758,450 per annum, for the 3 years before specified, there was consumed, within the United States, $7,993,818, on an average, of each year,—$1,495,938 *more*, each year, than was received from all the wheat, Indian corn, rye, oats, and other small grains, biscuit, potatoes, flax-seed, and hops, exported in 1833, to every part of the world. *Double* the amount of silks imported might be raised and manufactured in our own country, chiefly by women, children, and infirm persons, without materially detracting from any of the other productive branches of industry. The aliment of the insect that afforded this luxury was first to be supplied, and the efforts of the Institute were for years most assiduously and successfully applied in accomplishing this object. Individuals followed the example of importing seeds, and at this time, and by these means, millions of thrifty mulberries are now growing in our country, affording sufficient nutriment for incalculable numbers of silk-worms. If the American Institute had done no other act of public benefit, its members would have been entitled to the gratitude of their country.

But the labors of the Institute have not stopped here. Under its auspices seven successive annual fairs have been held; and, on the best computation, full twenty thousand different specimens exhibited. No branch of industry was unrepresented. Most of these articles were of a quality that would have commanded admiration in countries that commenced their culture or manufacture before we were a nation. Such was the display at the first fair, in particular, that it was confidently denied that the articles were American. The community, generally, had not kept pace at all with the rapid march of mechanical and manufacturing improvements.

The interest taken in these exhibitions is shown by the throngs that resorted to them. From the best estimates afforded, more than 200,000 persons were visitors, at the several exhibitions referred to. The brilliancy of these exhibitions attracted the attention of all classes of our citizens. What was said in the official report of the third annual fair, will apply to all. The managers observe, that "they cannot but contemplate the third annual fair of the Institute with pride and pleasure. To those who sought recreation and amusement, and looked no farther, it afforded innocent gratification."

Those who can feel a patriotic pride in beholding the progress of their country in manufactures, and the arts, and an increase of its self-sustaining resources, *in advance* of their best hopes, realized more animating and exalted sensations. The gay and fashionable were delighted; the middling classes, our city yeomanry, the steady supporters of order, law, and religion, enjoyed a rich feast. The curiosity of the inventor and artist found food to satisfy itself among the almost infinite variety that ingenuity and skill had

* Many of the facts hereafter stated in relation to Doctor Pascalis are derived from that accomplished biographer and scholar, Col. Samuel L. Knapp, who is a member of the Institute.

brought into existence. The emulating mechanic saw the choice productions of his workshop duly appreciated, and the evidence of their merit promulgated. Those who had been persuaded that we are too young a people to enter the course in competition with the old world, were satisfied that, though comparatively in infancy, our vigor, enterprise, and genius, have already accomplished results which have cost other nations centuries, and will soon enable us to distance them in the race of glory. To the exalted individuals, the patriotic chief magistrates and judges of our sister states, who had purposely attended, and to our own distinguished citizens, *in* and *out* of office, who were present, countenancing and encouraging our exertions, we tender our thanks. "The praise of illustrious men," say the managers in conclusion, "has *always* been a most acceptable reward to genius and enterprize; and their presence, and countenance, will *always* excite to higher efforts, and still more beneficial undertakings."

These fairs were peculiarly timely in their influences. Many of them were held while the great national question of protection or abandonment was pending; and for the purpose of convincing the most obdurately incredulous, a list of the principal articles, with the duties, was appended to the report referred to, which confirmed the long disputed facts, that the same articles which were early and effectually protected, are the very articles now fabricated in the greatest abundance and perfection, and the very same articles procured by the consumer, with the least cost—confirming, most conclusively, the numerous former reports made to the Institute in favor of protecting duties. The influence of these exciting exhibitions, through all the departments of productive industry, who can calculate? They are all intimately connected, and flourish and decline together. These exhibitions have created a confidence among capitalists in our ability to manufacture, and thereby ingenuity has been better and more certainly rewarded. The intensity of the competition has operated through all the departments of the workshop—from the owner to the journeyman, down to the humblest apprentice,—and carried genius to its utmost stretch. It is on these occasions, and by these means, that obscure artisans are enabled to bring their fabrics to public view, and profitable markets. Some of the finest specimens that received the highest premiums were made by hands before unknown, expressly for the last fair, and by consent of their employers. By such full, repeated, and continued displays, opportunity is given to observe every improvement, and to profit thereby; and thus the knowledge of new discoveries and improvements is early scattered, and brought into general use. It is here the consumer can accommodate himself with the article he requires, made in the most skilful manner. The names and numbers of the fabricators and agents are conspicuously labelled on the article. Every sale effected is beneficial both to the manufacturer and consumer. The wants of the consumer are well supplied, and the ready sale stimulates the manufacturer to fresh exertions. The extent of the sales effected by the last fair probably exceeded in value all that were brought to the exhibition rooms. Most of the first premium fabrics were disposed of at an early day, and many of the stores and warehouses from whence the articles came, were afterwards sought out, and purchases made from them to heavy amounts.

Here the progress of manufactures, from year to year, may be distinctly noted. Hitherto each anniversary has afforded specimens superior to any that have preceded. New articles have been produced, and old ones finished in greater perfection. Every fair has produced additional evidence of the accuracy and potency of labor-saving machinery. The wonderful facility with which many delicate fabrics may be multiplied, has been exemplified in giving a finish of which the human hand is totally incapable. I ought not to omit the especial and highly important benefits to this city derived from these public exhibitions. Prejudices and determinations adverse to manufacturing industry, of long duration, arising from foreign associations, and partial interests, have been, to a great extent, removed, or changed. These peaceable and wholesome conflicts, in which the competitors have strove to procure our necessaries and comforts cheaper and better than before, have been accompanied with a moral influence highly favorable to patriotism and genuine American feeling, and at the same time of a most enduring nature.

But, after all, the establishment of a statistical library, (one of the late undertakings of the Institute,) will confer on it more certain perpetuity, with accompanying utility, than all that has been done besides. If in process of time, our city should be ravaged by hordes of barbarians, the library of the Institute might suffer a similar fate with some of the works of art and genius of ancient Rome. But, we trust that no such destiny awaits us, and imagination can scarcely conceive any other destructive visitation. Knowledge, it is said, is power—and its seeds are sprouting in all parts of Christendom. It has taken deep root, grown, and spread, all over our republic. Its healing influences pervade all classes of society. The schoolmaster has been among us, and done his duty. The value of our institutions is universally appreciated, and a war of ignorance and barbarism, upon them, would be considered a war upon the people's best interests and hopes—such a common enemy would be hunted down with resistless and exterminating force. *The library of the American Institute will last as long as letters.* Its 3000 volumes already subscribed, and contributed, will double, triple, and multiply ten-fold in a few years. Compare the unexampled progress of this library, with some other libraries in this city—which opened with bountiful subscriptions in money—and phalanxes of wealthy names to give effect to their money and their efforts. It will be found that the Institute, which commenced without a dollar, have, since their library rooms were opened—within the last year—doubled the number of volumes procured by similar establishments in this city, commenced years before this Institute was incorporated. But the quality of the books, more than the number of volumes, is calculated to give value to our establishment. It is literally a library of practical utility, not surpassed, at this time, by more than one or two libraries in the State.

What has principally conduced to this unexampled success, is the extraordinary liberal terms held out to subscribers. Twenty-five dollars in money, or books, confer the privileges of the library, and nothing further is ever required.

Who is there, in this reading age, who cannot contribute, from their own shelves, what is required to gain access to one of the most useful libraries in the country? It was intended to benefit that class whose income would not warrant the contributions in money in the outset, and the after yearly dues, required by most other large libraries. It is in fact an exchange of a few books, already perused, for an extensive library, to which the subscriber may at all times resort, and select, for a reasonable time, a volume to take to his home. It is the design, as far as practicable, to obtain such books as relate to the manufacturing and mechanic arts, and statistics in general, embracing particularly statistics of the improvements of the last fifty years.

A general and accurate knowledge of statistics is essentially necessary, in our reasonings on political economy. And this library is intended to promote a taste for this useful, but hitherto, (in this country,) much neglected branch of human knowledge. The most ruinous consequences in legislation often follow from ignorance of facts. The premises are based on error, and the conclusions are alike erroneous. A single case will be stated as an illustration.

After the high protective duties were imposed on coarse cottons, *every day* these articles were offered for sale, of a better quality—and soon prices fell from 25 cents to 9 cents per yard, and now they are sold at 6¼ cents per yard. The advocates of home industry confidently relied on these facts, as evidences of the wholesome effects of protection, and the policy of extending similar encouragement to other unprotected articles. The free trade advocates said, no; they contended that the reduced prices of coarse cottons had been caused by the fall of cotton. They had not learned, that whether cotton was 10 or 20 cents per pound, would not, at the farthest, make a difference of more than 2½ cents in a yard, and for a reason that is unanswerable: because 1 lb. of cotton will make 4 yards, and the reduction at that time was from 25 to 9 cents, a nett reduction of 16

cents. Had they known this, they must have readily seen that 13½ cents, after deducting the 2½ cents, would have been still unaccounted for. Others ascribed the fall to the reduced prices of manual labor. A very little knowledge of facts would have satisfied them, that only a fraction of manual labor is required in making a yard of this cloth, not ½ a cent. The *perfection* of cotton machinery arises from its dispensing with manual labor, almost entirely. Others again said, the decline must be attributed to recent improvements in machinery. If they had inquired, they would have found the first cotton machinery ever used in this country was in successful opperation, and successfully competing with the new concerns with their improved machinery. And if they had gone among the manufacturers of cotton, they would have found it a controverted question, whether any essential improvements had been made. The truth is, that all the reduction of prices on coarse cottons, since the tariff was made—arising out of the fall of cotton, and manual labor, and improvements in machinery, *combined*—have not varied the prices of these cottons 6¼ cents per yard. But allowing that they have reduced the price full 6¼ cents, they are still 50 per cent. cheaper than when the tariff was laid: clearly showing that each and all of the reasons specified are totally inadequate to account for the reduction that has taken place in coarse cottons.

A statesman, legistating from such mistaken views of the facts—the very ground-work of his premises—would do inconceivable mischief.

The *fact* is, that the principal cause of the low prices of cottons arises from confidence, capital, competition, industry, and economy. The unexampled high duties on imported cottons gave confidence—capital followed—skill and industry were tempted by the rewards which capital offered. Competition naturally sprung up, and the efforts of competition introduced renewed industry, division of labor, economy, and every species of saving that ingenuity could contrive. It is an everlasting truth, that the main cause of our unprecedented success in the manufacture of cottons, amounting at this time, and at their present low prices, to thirty millions of dollars per annum, *is* the high protection they at an early day received. If protection has had no influence on cottons—and until the minds of statesmen are immoveably settled in this principle, the rewards of our industry must forever be precarious—why did prices, when they were unprotected, continue nearly stationary, 15 years after Arkwright's jenny was introduced?*

Why have linens, silks, fine broadcloths, and other articles, either not at all or inadequately protected, nearly maintained their former prices?

A correct knowledge of facts would have arrested innumerable pernicious heresies in political economy, that have led to legislation which has often disturbed and injured our whole social system.*

Twenty years after Arkwright's cotton machinery was first introduced into the United States by Samuel Slater, we had made comparatively but little progress in manufacturing coarse cottons. They were then more than 400 per cent. higher in their prices than at this time. There was no protective tariff, and the capitalist held back—and the consumer was left to pay, from his own pocket, the cost of transporting the raw material 3000 miles, and also the cost of bringing it back in the form of goods, with land carriage, taxes, insurance, &c., besides profits to the foreign and American merchant, *both*. Our statesmen relied on imported theories, instead of examining facts for themselves.

This tedious illustration, drawn from the manufacture of coarse cottons, has been adduced, not only for the purpose of showing the importance of a statistical library, where correct facts and accurate statistics may be obtained, but also incidentally, to explain the effects of a high protecting tariff on the domestic manufacture of cottons, which now supply thirteen millions of our citizens with a necessary article at half its former cost; besides adding to our exports to foreign countries two millions five hundred and thirty-two thousand five hundred and seventeen dollars. [Vide Reports of Secretary of the Treasury.] If the genial influences of protection had not been applied, the manufacture of cottons would in all probability have been of as little moment, in our list of productions, as that of flax, which had not been adequately protected, and accordingly has not made the smallest progress in fifty years.† Fortunately, statistical knowledge is beginning to find favor. Unsatisfactory conclusions, drawn from data supplied by the imagination, at war with facts, are beginning to be regarded in political economy as useless as they are in other sciences. And we are warranted in anticipating that, in the future history of this Institute, the establishment of this library at this time, and upon the principles and for the purposes contemplated, will most assuredly be pronounced one of the wisest of all our undertakings.

The foregoing embraces a brief sketch of some of the prominent things which the American Institute have already done. If the question is asked what we have done, we can refer to our written and printed communications, domestic and foreign. We can read our numerous reports in defence of adequate protection, when heresies were industriously propagated by our foreign rivals, intended for our destruction. We may also refer to our able and ample discussions before the Institute on subjects most intimately connected with our domestic industry. We can show the groves of mulberry trees which have grown from seeds we have distributed. We can conduct the inquirer to our fairs, and through our exhibition rooms, and point him to the splendid displays—the unalloyed fruits of American perseverance and ingenuity. We can show him the long list of diplomas and medals, and other rewards, the testimonials of merit, and the successful stimulants of genius. We may read to him the eloquent addresses delivered at our fairs by distinguished orators and statesmen from other States. And, above all, we can introduce him to our library, and show him in its fulness the compressed wisdom of ten thousand minds—a monument of our exertions that will reflect honor upon us as long as knowledge is valued. We have, conformably to our charter, promoted domestic industry by encouraging Agriculture to cultivate her choicest productions. We have endeavored to place manufactures on a firm foundation, that thereby they may afford agriculture a perpetual market. By the reciprocal influences of each on the other, we have increased the exchangeable commodities which give employment to commerce; and, by these combined means, wealth has followed to apply to the ornamental arts. In a word, the farmer has found a market—the manufacturer has procured the desired material—the merchant has multiplied his purchases, sales and profits,—and the artist is better rewarded by the abundant means acquired by all.

It will be remembered I also proposed to name some things that are hereafter required *to be done*.

At an early period of this Institute a resolution was passed, with a view of obtaining reports of facts from all the different occupations and professions, and particularly such facts as would show the effect of the tariff on the qualities and prices of manufactured articles. The object of this resolution, as heretofore shown, has been partially accomplished. It is earnestly to be hoped that the whole plan will be completed. It will afford a mass of facts eminently useful to the political economist, and the practical statesman.

Policy demands that efficient means should be applied to the raising of silk, by means of bounties on the culture and exportation, if protective duties are permanently to be withheld; but the last are obviously to be preferred, and sooner or later will be resorted to. Experiments prove that our soil is propitious to the growth of the mulberry tree, and our climate congenial to the rearing of the insect that produces the silk. Ingenuity, by the stimulus which capital must bring

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* *Note.*—Fifteen years after it was introduced, viz. in 1805, only 1000 bales were manufactured, and in 1831, 214,882 were manufactured. The increase of the cotton manufactured for years had been equal to 25 per cent per annum.

* Vide Proceedings of the New-York Convention, 1831.

† According to Smith's history of the state of New-York, between the 9th December, 1755, and the 23d of February following, 76 days, we shipped 12,588 tierces of flax seed to Ireland.

The imports from Great Britain for the colony of New-York were then estimated at about $480,000 per annum; they now amount to $571,000,000 per annum.

The amount of flax seed shipped from the whole United States to Great Britain and Ireland is stated to have been only 17,243 tierces, in 1832, though our population had increased more then six times told, and our importations into this State more than 100 times.

into activity, will perfect new labor-saving machines for its manufacture. But without protection, the cautious capitalist will not encounter the competition of those immense establishments which centuries ago were nurtured into existence by government favors, as exclusive as legislation could create, and which have since been fortified by overgrown accumulations of capital, and are now filled with the most skilful workmen. The protective shield of the government must, ere long, be extended. In the mean time, let nurseries be cultivated for the spread of the plants of the mulberry, on liberal, and, if possible, on gratuitous terms.

A systematic plan should be devised for conducting our fairs. The committees of publication, arrangements, premiums, &c., should be desired to report the inconveniences and defects they have observed in conducting their departments, for the purpose of framing a well-digested system, that shall afford a ready rule of conduct for future managers and committees. The seasonable appointment of competent, disinterested, and respectable judges, whose punctual attendance may be relied on, is an important consideration. Much of the value of the rewards bestowed depends on the standing and character of the persons awarding them. Secure inclosures should be provided for choice fabrics and delicate machinery. Security against damage would increase the number of articles, and render the competition more general and more beneficial.

Semi-annual fairs, for the purpose of sales *only*, have been suggested. It is worthy of consideration how far they might be made useful, and whether they might not be made a source of revenue to the Institute.

No *one* act, however, has contributed more to exalt the American Institute than their library. Get knowledge—get knowledge—are the watch-words of wisdom among our competitors. Our library will afford an exhaustless fountain. An effort should be made, by every member, to increase its volumes. Every member should consider it his library—every member should become a subscriber, and solicit his friends to follow his example. The value of the scrip received is of more worth than the consideration paid. A united effort by all the members of the Institute would in a few weeks create the greatest library in the State. Such an effort would confer honors on the present members as durable as the benefits which would flow from it.

The ward institutes, which have already been partially organized, next require our attention. They are no more nor less than branches, intended to operate in all the wards of this city, and eventually to be extended to the counties out of the city.

In addition to the useful information they may from time to time report, great assistance might be rendered by them in obtaining minute local statistics, and in adding to the members of the mother institute, and also in advancing the library. The importance to the country of one great central institution, devoted to industry and the arts, might be urged with great effect in our occasional intercourse with those who visit our city. A formal committee might with great propriety be appointed to visit our principal cities and villages, and invite public spirited gentlemen of independent fortunes to assist in forwarding the useful objects of the Institute. Large numbers, no doubt, might be induced to become members, and also contributors to the library. A considerable number of gentlemen out of the city have already enrolled their names as members; and others, unsolicited, have subscribed to the library. By frequent communications with the contemplated branches, and by cultivating a correspondence with literary and scientific institutions, and individuals, generally, in this and foreign countries, the earliest information may be obtained of all new discovered materials, and new and useful processes in manufacturing.

There is a variety of things, in relation to the Institute, which would by many be classed among small and unimportant matters, that may be done or neglected without any material injury.

But he has lived and observed to little purpose, who has not learned that many of the great operations of business, public and private, are controlled by them. Punctuality, by many, is classed among these unimportant matters. The reverse of this is the fact. The success of all public and private institutions depends much on the punctuality of their officers. The want of punctuality does not end with the delinquent; it discourages and disheartens those who *are* punctual, and sometimes creates ruinous derangements. One failure to form a quorum is often succeeded by another; and much exertion is often required to finish the business, which might have been prevented by a punctual attendance of a single indidual a few minutes. The tardiness of one small wheel may throw an immense machine completely out of gear.

Much of the precious time of the Institute has on former occasions been consumed in prolonged debates, on qestions of order, law, and constitutional construction, often totally irrelevant. These discussions are particularly provoking to our best business men—members who trouble themselves very little about forms, *if* the work required to be done *is* done, and *well* done.

It is matter of congratulation that this useless habit is almost entirely corrected.

Some regular plan, and a notice of the business of the coming meetings previously announced, would, it is believed, be beneficial. Members might then examine and reflect on the subjects to be brought under consideration. The discussions would then exhibit the results of investigation, and be profitable to the hearers. The frivolous questions discussed, and the protracted and useless verbiage expended on these questions, has formerly driven valuable members from the Institute. A previous assignment of business, and notice of the same, would have a powerful tendency to correct this evil, and add to the respectability of the Institute.

By extending the influences of the Institute into the country, among the manufacturers, they may induce their agents, the domestic dealers, in the city, who are receiving such liberal commissions from the success of manufactures, to enlarge their views, and lend a helping hand at our fairs, and not suffer the great interests of cottons and woollens to be meagerly represented by a few scanty specimens. If these domestic agents are deterred by the trouble and expense of the carting, or the fear that the goods sent may be rumpled, let the owners make their agents good. They will be more than compensated by the increased demand and ready sales of the exhibited articles.

Not only individual, but legislative aid, should be invoked in favor of the objects contemplated in our charter. The utility of statistical knowledge has already been commented on. Our legislative documents contain a mass of undigested statistics, obtained by the State at great expense, which, if selected, digested, indexed, and published, would be invaluable. It is now totally useless to nearly the whole of the community.

The New-York Annual Register, compiled by the industry of one of our members, is now almost the only work from which even a partial knowledge of the resources and capabilities of this State can be obtained. Some competent person should be employed, to arrange the information already procured, and supply the deficiences. The State would be indemnified ten-fold for the expenditure it would require—by the discoveries it would promote—the emigrations it would invite—and the increased demand it would create for our improved and unimproved farms. A memorial embracing this subject, and the subject of silk, praying for an appropriation, ought to find favor with an intelligent legislature.

The late determination of the Institute, in favor of a course of lectures, from members of the Institute, *exclusively*, is calculated to do good. Those whose habits do not qualify them for extemporaneous efforts, are often in possession of valuable ideas. Every member of the Institute can write, and read. Most of the members have important ideas, particularly in relation to their own everyday concerns, and business. The intention of the proposed course of lectures is to bring these ideas into the possession and use of the Institute, from minds of different structures, habits, professions, and inclinations. They are intended to be the offsprings of experience, and the practical suggestions of actual business. They will be novel to most of the members, and entertaining for their novelty. They will be useful, because they are derived from experience, the great source of useful knowledge and human improvement. Such a collection of facts as will naturally be collected, opened to the examination of a variety of inventive minds—and our patent office shows we are

not wanting in them,—cannot but suggest new thoughts, and lead to new improvements. A single glance has often induced a new principle, or led to a new combination of immeasurable consequence. It was, no doubt, an apparently accidental thought that led our countryman, Whitney, to the construction of his cotton gin. *That* thought, subjected to the patient workings of ingenuity, and perfected by practical skill, has doubled the value of lands, whose inhabitants are sufficiently numerous to constitute a nation, and has enabled the United States to sustain the balance of trade with the commercial world. It is not intended by these lectures to exhibit orators. They are not intended to ingratiate some favorite candidates for office with the people. But to give confidence to plain unassuming middling men, and to induce them to put on paper, and read to their brethren, such facts, and reflections, as they in their respective vocations have gathered—expressed in the style, and language, in which they think, and speak, before they have undergone the expanding ordeal of declamation. We desire the native ore directly from its bed, and not after it is reduced to a glittering cobweb by the gold-beater. A collection of such discourses would be sought, and read, with satisfaction and profit. They would contain knowledge not found in books. Lectures so conducted will give confidence to those who prepare them; and, in process of time, men now obscure, and unthought of, will learn to reason, deduce principles, and march *direct*, to conclusions, with the accuracy of philosophers. This course of lectures is intended to form, in the Institute, an undisputed palpable feature of republicanism: not that sort of republicanism which is assumed by partisan politicians, which *lives* only while the polls are open, and expires when they close. But that republicanism, which at all times recognizes, in the members of this association, a perfect equality of privileges, and which desires every member to participate equally in all its performances, honors, and advantages. An early effort should be made for the establishment of a periodical Journal,—weekly, monthly, or even quarterly. It would collect and distribute *knowledge*; make the objects and operations of the Institute better understood; increase its members, and thereby its ability to accomplish the designs contemplated by its act of incorporation.

A collection of models of machines, and specimens of art, has, as it were, spontaneously commenced. The library rooms now constantly exhibit some of the fruits of art and genius. This commencement of a cabinet, interesting and useful, should be nurtured and sustained. It will present a miniature display, in this great central emporium, of the improvements of the age, convenient for examination. Competent persons may be appointed to explain their properties and uses. Why should not New-York contain such an establishment? Paris has her *Conservatory of Arts and Trades*. It is admired by all strangers who visit that interesting city. It contains a collection of all the instruments and machines used in the sciences and trades throughout France; all the inventions which have obtained rewards from the French Government, or public bodies, as well as patents—all find a place in this repository; and also many of foreign origin. Foreigners are admitted by merely showing their passports. A man attends twice a week to give descriptions to visitors. The National Repository in London, with similar objects to our Institute, is patronized by the King. The managers and inspectors are selected from the most distinguished men in the kingdom. In the list of officers are members of Parliament, Lords, and Commoners, members of the Royal Society, and many of the first philosophers and scholars in the British empire. Most of the great cities of Europe have repositories for similar purposes. Let it not be supposed, because *we* are wanting in noblemen, that we cannot support such an establishment. We have nature's noblemen. The people are our noblemen. They have shown their devotedness to *our* and *their* cause. For seven successive years they have patronized and upheld the American Institute. They are not untaught operatives, but an enlightened, reflecting people, who not only know how to use their hands, but are familiar with principles, and whose chances of making important discoveries must be proportioned to their knowledge.

The world does not present a position as auspicious for a great and infinitely varied museum of useful curiosities *as our city*. How propitious its tendency to promote that alliance of art and science, so conducive to useful discoveries and improvements! How greatly must it contribute to elevate still more that portion of our fellow citizens whose occupations, within a century, were considered degrading! They were for ages excluded from the benefits of science, the great vivifier of the arts. The laboratory was kept far off from the workshop; and the fabricators of our comforts were suffered to group in ignorance and darkness. Science has at last entered the factory, and the shop, and a new era in productive labor has commenced. The philosopher, instead of being employed among wild theories and visionary fancies, is busy in selecting and arranging *facts*, on which to employ his philosophy, and base his arguments. The race of schoolmen are defunct. The hunters after the philosopher's stone, the seekers after perpetual motion, are rarely heard of. The train of abstract reasoners, the race of alchymists, with their cotemporaneous witches, hobgoblins, and ghosts, have sunk into oblivion together. The philosophy of common sense has succeeded; well attested facts and analogies hold the place of abstract visions and logical subtleties. Every thing is submitted to the ordeal of experiment—"weighed, measured, and analyzed." Every step that precedes conclusions is fortified by demonstration. Accordingly, our improvements within the last fifty years have surpassed *all* that had gone before. Every new improvement has led on to others. Every new discovery has opened new passages into the endless labyrinths of nature.

I have thus given a rapid notice of what may be done. Standing as we do on the vantage ground, elevated as it is by discovery and invention, are our anticipations all visions, or are they destined to be realities? Are we to suppose that we have reached an impenetrable barrier, erected against future improvement? Before the invention of the mariner's compass, who could have conceived that an inanimate substance could be found that would be a safe guide on the trackless ocean in the darkest night? Before the telescope was invented, who could have conceived of an instrument that would light up a way in the heavens, ten thousand times farther than any human eye before had ever penetrated? And may not some future discovery enable those who come after, to penetrate the hidden properties of matter, and the undiscovered agencies of nature, with equal success? What enthusiast, before it was done, would have believed that machinery could do the work of forty thousand millions of people? This was effected, several years since, on one comparatively small island. To have once hinted that the lightning could be disarmed of its terrors, and made harmless, by any human contrivance, would have been blasphemy. The wonders of steam we have all witnessed, on the land and on the water. Its powers began but yesterday to unfold; now guided by genius, it propels the magnificent ship "against tides and tempests." It enables the freighted boat to buffet the impetuous currents of our mighty rivers,—ascending sure, steady, and direct, to the place of destination. It wings the car in its rapid course on the railway, from city to city, and from country to country. To facilitate the discoveries and operations of the miner, rivers by its potent workings are disgorged from the deep caverns of our earth. In our forges we may see it "seizing with iron claws ponderous masses of iron, and beating them into bars, or pressing them into plates, and cutting them in pieces, as if they were ribbons." Steam, exhibited in its minuter operations, in the factory, is not less wonderful: attenuating the smallest fibres of our cotton with a regularity, delicacy, and accuracy, that no human hand could accomplish, and which nothing but the unerring instinct of the silk-worm, or the spider, can equal. Such are the instruments of this same power which knowledge has unfolded and subjected to the mastery of man. What is there too unwieldy for its strength, or too delicate for its touch? But these are only the precursors of other still more sublime accomplishments reserved for human genius—the dawnings of that perfection which futurity will unfold.

Let us, one and all, seize the opportunity, and apply the means which Provi-

dence has conferred upon us, by employing our best exertions and talents to stimulate and quicken invention, by spreading knowledge, and instigating emulation; and thereby improvement will be accelerated, and the proud dominion of mind over matter will be still further extended.

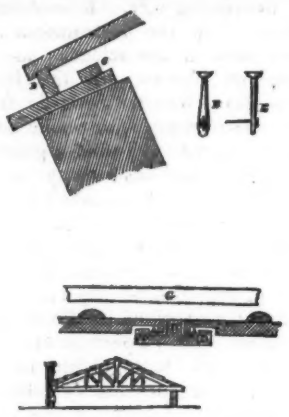
Specification of the Patent granted to WILLIAM NORTH, *of Stangate, Lambeth, in the County of Surrey, Slater, for an Improvement in Roofing or Covering Houses and other Buildings or Places.*—Sealed January 29, 1833.

To all to whom these presents shall come, &c. Now know ye that my said invention is described and ascertained in manner following, (that is to say):

My improvement in roofing or covering houses and other buildings or places, partly consists in laying and retaining upon the wooden or iron rafters of roofs, slates or slabs of slates, each of which, with the exception of those used in the lower tier of all, is raised at its lower end by means of a fillet of slate, lead, or other metal, or of mastic composition attached to the under side of the slate or slab, which fillet, excepting when laid on slates, or slabs of slates of uneven surface, is scolloped on its under side more or less, as may be required, so as to admit air from without to the timbers of the roof, and to let steam, heat, and damp, escape from within. My said improvement further consists in laying or retaining upon the wooden or iron rafters of such roofs, slates or slabs of slate, each of which, with the exception of those used in the upper tier of all, has attached to the top side of the upper end of each, a fillet of slate, lead, or other metal, or of mastic composition, smaller than the fillet before described, and the upper end of the slate, or slab, to which the smaller fillet is attached, being overlapped by the lower end of the slate or slab to which the larger fillet is attached, the smaller fillet excludes wet from without, while it does not prevent the air from being admitted to the timbers of the roof from without, or steam, heat, or damps, escaping from within, which completes the horizontal joints. Further, on the under side of each slate or slab, a groove is sunk at each side, the outer edges of which overlap the edges of a slate, or iron bearer, which has a corresponding groove sunk on each side of its upper surface, forming a channel for the discharge of wet that may get into the vertical joint.

And in order that this my specification may be sufficiently clear to enable competent persons, at the expiration of my patent, to practise my invention with the same advantage which I myself now possess, I shall describe the whole process of roofing, or covering houses, and other buildings or places, in the manner which I practise.

Description of Drawing.—The slates or slabs of slate are in thickness from 7-8 inch to 1 inch, according to the strength required, in length from 2 feet



to 6 feet, the breadth about two-thirds the length. On the under side of each slate or slab, is a groove at each of its sides about 3-4 inch wide and 1-4 inch deep, fig. No. 1, A, A.

On the under side of the lower end of each slate, excepting those used in the bottom tier, or eave course, is a groove 3-8 inch and 1-8 inch deep, into which is fastened a fillet of slate, lead, or other metal, about 3-8 by 5-8 inch, by means of a seam of mastic or oil cement, having its bottom edge scolloped according as little or much ventilation is required, or not scolloped if the face of the slate upon which it bears is of uneven surface, fig. No. 2, B. And upon the upper side of the top end of each slate, (excepting those used in the upper tier of all,) is laid a fillet of mastic or other composition, or of slate, lead, or other metal, about ½ inch wide, ¼ inch thick, fig. No. 2, C: observing, that I generally use a fillet of lead for the bottom end, on account of its exposure to the weather, and its flexible quality in bending to the unevenness of the slate, and a fillet of mastic for the top end on account of its adhesive quality to the slate, and being partly protected from the weather. The bearers upon which the sides of the slates or slabs bear, forming the vertical joints, are of slate or iron, from 1 to 2 inches thick, of the same length as the slates, and about 3 inches wide, with a groove about ½ inch wide and ½ inch deep on each side of the upper face, fig. No. 1, D, D, D.

Method of fixing the improved roofing.—The wooden or iron rafters must be placed horizontally, of sufficient distance apart to allow of the top end of the slates having 2 inches bearing, and the bottom end to overlap the slate below 2 inches, the principals or binders are about 8 feet apart. The slate or iron bearers are sunk and nailed at the upper ends, a sufficient depth into the rafters to allow of the slates or slabs bearing equally upon the rafters and upon the bearers, the bottom-end overlapping the head of the slate below 2 inches, and the sides of the slates or slabs overlapping the sides of the bearers, fastened at the bottom-ends with metal loops, E, E, countersunk into the face of the slate, and nailed to the rafters.—In witness whereof, &c:

Enrolled July 29, 1833.

[From the Mechanics' Magazine.]

COMPARATIVE VALUE OF FUEL.—As a knowledge of the relative value of the various kinds of fuel in use cannot fail to be of interest to all, and of benefit to most of our readers, we do not hesitate to publish at length the following very valuable article from Porter's Chemistry of the Arts. The information contained therein, if properly applied to the every-day business of life, will amply repay each reader for his subscription to the Mechanics' Magazine—even if he has paid in advance. The table of the comparative value of the 66 different kinds of fuel should be frequently read by those who desire to use economy in obtaining their supply of fuel.

Whatever kind of fuel it may be considered best to employ, it is extremely desirable that it should be as dry as possible, otherwise a great part of the heat it contains will be lost in converting the water in the fuel into vapor, which of course escapes up the chimney without producing any useful effect.

Fuel is often unnecessarily exposed to the weather, or put in wet places; and the injurious effect of introducing damp into a close fire-place is never considered.

Pit Coals.—There is considerable difference between the pit coals; and it has perhaps been too little attended to by those who are the chief consumers of this expensive article. The subject has not even been studied with much attention, except so far as relates to the production of gas; and the facts that have been established by these researches are not very useful in other applications of fuel.

Caking coal, also called binding coal, crozzling coal, is obtained in great abundance from the extensive coal-fields in Northumberland and Durham; and is that which is sold in the London market as Newcastle coal.

When heated, this coal breaks asunder into small pieces; and the heat being raised to a certain degree, the pieces cohere, and form a solid mass, from which property it is called caking-coal. It lights easily, and burns with a lively yellow flame. It requires to be frequently stirred or broken up, particularly when it cakes very hard; but different varieties differ considerably in this property. Of the Newcastle coals, the best Wall's-End make a brilliant and pleasing fire, burn away quickly, and do not cake hard, hence it is preferred for heating rooms; but the Tanfield Moor burn slowly, cake very hard, and afford a strong and long-continued heat, and is used in furnaces and forges. The other varieties are of an intermediate character.

Caking coal gives out a great quantity of heat, and, with attention, burns a long time; consequently, where it can be procured at a reasonable price, it is commonly preferred.

From the trials of Mr. Watt, it appears that a bushel of Newcastle coals, which

weigh, on an average, eighty-four pounds, will convert from eight to twelve cubic feet of water into steam, from the mean temperature of the atmosphere; and that a bushel of Swansea coal will produce an equal effect.

Dr. Black states to the effect, that 7 pounds .91 of the best Newcastle coal will convert one cubic foot of water into steam, capable of supporting the mean pressure of the atmosphere.

In some experiments tried by Messrs. Parkes, it appears, that by their improved method of constructing boilers, an effect was obtained, equivalent to converting one cubic foot of water into steam from the mean temperature, with 7 pounds .45 of coal, in the case where the greatest effect was produced; but at a mean, 8 pounds .15 of coal were necessary to produce the same effect; which is only one quarter of a pound less than the mean of Mr. Watt. From a mean of several experiments, Smeaton makes it require 11 pounds .4 of coal to produce the same effect; but the kind of coal is not described.

Mr. Tredgold found that after the brick-work, &c. of the boiler of a steam-engine was warmed, a little less than one pound of Wall's-End coals would make a cubic foot of water boil, from the mean temperature of fifty-two degrees. To produce the same effect with inferior coals, a stronger draught, and more time and attention, was necessary.

Splint Coal, or hard coal, called slaty cannel coal by Kirwan, is esteemed equally valuable, for many purposes, as the Newcastle caking coal. It is obtained near Glasgow, in Ayrshire, Scotland, and in several of the English and Welsh coal-fields.

A greater heat is necessary to make it kindle than is required for caking coal, and consequently it is not so well adapted for a small fire; but a large body of splint coal makes a strong and lasting fire. It does not produce so much flame, nor so much smoke, as caking coal, and does not agglutinate or bind together.

The splint coal of Scotland was considered by Smeaton to be equal to Newcastle coal for steam-engines.

Cherry Coal, or soft coal, constitutes, says Dr. Thomson, the greater part of the upper seams of coal in the Glasgow coal-fields; and it is also abundant in Fifeshire. He considers the Staffordshire coal to be of the same species; and the Edinburgh as intermediate between it and splint coal.

It readily catches fire, and burns with a clear yellow flame, giving out much heat; and the flame continues till nearly the whole of the coal be consumed. It burns away more rapidly than either caking or splint coal, and leaves a white ash. For most purposes it is less economical. It is easily distinguished from caking coal, by its not melting or becoming soft when heated. It makes a more agreeable fire, and does not require to be stirred. It requires care and management in an open grate, even to burn the small fragments which are made in breaking up the pieces to a fit size for the fire. Hence the small coals are often mixed with clay and made into balls. When these balls are dry, they make an excellent addition to the fuel for an open fire, producing a very durable heat.

Mr. Watt states that one hundred weight of good Wednesbury coal will produce the same effect as one bushel of Newcastle coal.

Wood.—In some places wood is used for fuel; its effect in producing heat is found to depend considerably on its state of dryness. Several experiments, made by Count Rumford, show the effect of dry wood to be much greater than that of unseasoned. Unseasoned wood contains about one third of its weight of water. The kind of wood is also a cause of some difference; from the experiments of Count Rumford, lime-tree wood gives out most heat in burning.

With his improved boilers Count Rumford made 20 pounds .10 of ice-cold water boil with one pound of dry pine wood. The same weight of pine wood unseasoned, would produce less effect by one-seventh. Beech wood afforded much less heat than pine; for one pound of dry beech made 14 pounds .33 of ice-cold water boil. A cubic foot of dry beech weighs about forty-four pounds.

According to Fossombroni, wood produces heat enough in its combustion to evaporate twice its weight of water, or to prepare two-thirds of its weight of salt. Count Rumford's trials make the effect of wood about one-third more, which may fairly be attributed to his superior skill.

Peat, considered only as a fuel, may be divided into two kinds. The first is compact and heavy, of a brownish black color, and with scarcely any vestiges of its vegetable origin remaining. This is the best kind. When it is once lighted it preserves fire a long time.

The second kind is light and spongy, of a brown color, and seems to be a mass of dead plants and roots, which have undergone very little change; it inflames readily, and is quickly consumed.

Peat gives out an odor, while it is burning, which is disagreeable to those who are not accustomed to it. It affords a mild and gentle heat; but is not a good kind of fuel for supplying furnaces for boilers; it is much better adapted for flues. It is of various qualities: some burn quickly with a bright flame; others burn slowly, and, according to Clement and Desormes, afford one-fifth of the heat that would be given out by an equal weight of charcoal. This nearly coincides with the ratio given by Blavier and Miche.

The weight of a cubic foot varies from forty-four to seventy pounds; and the dense varieties afford about forty per cent. of charcoal; the other varieties nearly in proportion to their density.

Charcoal.—Mr. Dalton, by heating water, obtained a result equivalent to melting forty pounds of ice with one pound of charcoal. But Dr. Crawford's experiments give sixty-nine pounds of ice melted by one pound of charcoal. Lavoisier's give ninety-five pounds and a half; Clement and Desormes ninety-five pounds; and Hassenfratz's trials, on various kinds, give a mean of ninety-two pounds of ice melted by one of charcoal, his highest result being ninety-six pounds, and lowest one seventy-four pounds. Mr. Tredgold considers forty-seven pounds of ice melted by one pound of charcoal as the real average effect of that fuel. A cubic foot of charcoal weighs about fifteen pounds.

Coke.—Lavoisier makes the quantity of coal to be that of coke as 605 is to 552 when the same effect is produced; and in addition to this increased power of giving out heat, it must also be considered that coke gives out no smoke in burning, whence it should always be used in furnaces seated in towns, in order to prevent any annoyance to the neighbors.

The present prevalent use of gas, for lighting towns and even houses, has brought a considerable quantity of *gas coke* into the market, which does well enough for heating rooms, but is far inferior to the stifled coke in its heating power, so that smiths and iron founders invariably use the latter kind, and when a great heat is required, the chemist should follow their example.

Coke has been tried against wood in Paris for warming the Opera-House. Fifty-eight pounds of coke, costing there about 1*s.* 3*d.*, produced the same effect as 160 pounds of wood, costing there about 2*s.* 6*d.*

Charred Peat.—According to Messrs. Blavier and Miche it requires 1666 pounds of charred peat to produce the same effect as 740 pounds of common charcoal.

The charred peat, made by stifling, is superior, in its power of producing heat, to that made by distillation. Unfortunately the stifled charred peat is a kind of pyrophorus, which takes fire if it becomes accidentally wetted, or even in moist weather. In consequence of this property several accidents have happened by the rain finding its way into places where it is kept; it is on this account forbidden, by the laws of some countries, to be kept in towns.

Therefore the Dutch, who burn this fuel, not only in their houses, but even in pans under their feet while they are at church in winter, are in the habit of charring it at home as it is wanted. It is first burnt in the kitchen, and when they find it is red hot quite through, they then take it off the fire, put it in a close earthen or copper pot, and cover it down with a wet woollen or linen cloth, and by the air being excluded the fire is soon extinguished, and when it is cold it will resemble charcoal, except being covered with white ashes, and will, if properly charred, burn with scarce any smoke, and very little of the suffocating quality which charcoal has. This it is that makes the charred peat so proper for green-houses, for charcoal burnt in them is very prejudicial to the plants, and often fatal to the person who attends them.

[The intelligent author has here certainly fallen into a popular error in regard to the true cause of the suffocating quality of burning charcoal. The product of the

combustion of charcoal must be essentially the same as from charred peat: the combustible part of both is little else than pure carbon, and the products of their combustion are of course pure carbonic acid. The popular notion is, that the unpleasant odor exhaled from burning charcoal, which has for some time been exposed to a damp atmosphere, and particularly when first ignited, is the suffocating principle: hence the common impression that ignited charcoal taken from a common fire may be burned with impunity in an unventilated room, and that charred peat, which does not exhale the peculiar odor of charcoal, is a safer and less objectionable fuel under the same circumstances. Many lives are annually sacrificed from this erroneous notion. The only true ground of preference of charred peat for burning in green-houses is the slow and gradual manner in which it consumes. Charcoal, in this respect, is much less manageable. It is the sudden and unequal heats from charcoal, rather than any essential difference in the product, that renders its use so objectionable.]

The usual method of burning this peat in Holland, especially by the poor, is in cast iron kettles, and for boiling any thing over it this way saves half the fire it would otherwise take if burnt on a hearth, or in a grate, by the side of the pot reflecting the heat.

[The small Philadelphia furnaces, fabricated from the South Amboy clay of New Jersey, now in general use in our Atlantic cities, are admirably calculated to secure an economical expenditure of heat in the combustion of charcoal for culinary purposes, and for a similar reason. But they ought never to be used in an unventilated room.]

Adjoining to many of the capital towns in Holland there are a great number of small gardens with little summer houses, most of which are built with wood. Near Rotterdam there are nearly a thousand of these gardens, and almost all of them have some orange trees in them. In the winter they are preserved from the intense frosts, which generally last there for nearly three months, by means of this charred peat, the natural firing of that country, which is burnt in an earthen pan, or cast iron pot, in these little summer houses.

A collected view of the data from these experiments and comparisons is given by Mr. Tredgold. It is as follows:

Kind of Fuel.	Fraction of a pound that will heat one cubic foot of water one degree Fahrenheit's scale.	Pounds of fuel that will convert one cubic foot of water into steam.
Newcastle, or caking Coal	0.0075	8.40
Splint Coal	0.0075	8.40
Staffordshire cherry Coal	0.0100	11.20
Wood, dry pine	0.0172	19.25
—— dry beech	0.0242	27.00
—— dry oak	0.0265	30.00
Peat, of good quality	0.0475	53.60
Charcoal	0.0095	10.60
Coke	0.0069	7.70
Charred Peat	0.0205	23.00

It will appear, as Mr. Tredgold justly observes in his very excellent "Principles of Warming and Ventilating Public Buildings," that the utmost effect we can hope to gain in applying fuel must be less than double the measure of effect here given; and even to attain that effect, all the caution of conducting a philosophical experiment must be continually employed, which will be found impracticable on a large scale, and altogether incompatible with the simple apparatus and small share of attention which can be devoted to this end in real business, although there are not wanting persons who promise four, six, and even ten times these effects.

Improvement of Fuel by Mixture.—It is surprising that so few attempts should be made to improve the fires which are made in the open chimneys of elegant apartments by preparing the fuel; for, as Count Rumford observes, nothing surely was ever more dirty, inelegant, and disgusting, than a common coal fire.

Fire balls, of the size of goose eggs, composed of coal and charcoal in powder, mixed up with a due proportion of wet clay, and well dried, would make a much more cleanly, and, in all respects, a pleasanter fire than can be made with crude coals; and it is believed would not be more expensive fuel. In Flanders, and in several parts of Germany, and particularly in the duchies of Juliers and Bergens, where coals are used as fuel, the coals are always prepared before they are used, by pounding them to a powder, and mixing them up with an equal weight of clay and a sufficient quantity of water to form the whole into a mass, which is kneaded together and formed into cakes; which cakes are afterwards well dried, and kept in a dry place for use. And it has been found, by long experience, that the expense attending this preparation is amply repaid by the improvement of the fuel. The coals thus mixed with clay not only burn longer, but give much more heat than when they are burnt in their crude state.

It will doubtless appear extraordinary to those who have not considered the subject with some attention, that the quantity of heat produced in the combustion of any given quantity of coal should be increased by mixing the coals with clay, which is certainly an incombustible body; but the fact is certain.

In composing fire balls, it is probable that a certain proportion of chaff, of straw cut very fine, or even of saw dust, might be employed with great advantage. It is wished that those who have leisure would turn their thoughts to this subject; for it is conceived that very important improvements would result from a thorough investigation of it.

For the purpose of lighting a fire speedily, *kindling balls*, composed of equal parts of coal, charcoal, and clay, the two former reduced to a fine powder, well mixed, and kneaded together with the clay moistened with water, and then formed into balls of the size of hens' eggs, and thoroughly dried, might be used with great advantage instead of wood.

These kindling balls may be made so inflammable as to take fire in an instant, and with the smallest spark, by dipping them in a solution of nitre, and then drying them again; and they would neither be expensive nor liable to spoil by long keeping. Perhaps a quantity of pure charcoal, reduced to very fine powder, and mixed with the solution of nitre in which they are dipped, would render them still more inflammable.

[The foregoing meagre account of the relative value of several varieties of fuel, as determined by the heat produced in combustion, comprises about all the information which the labors of Crawford, Lavoisier, Rumford, Watt, Dalton, Clement, Desormes, and other philosophers, have shed upon the subject previous to the publication of Mr. Bull of Philadelphia, entitled "Experiments to Determine the Comparative Value of the Principal Varieties of Fuel used in the United States and in Europe," read before the American Philosophical Society of Philadelphia, in April, 1826. This is by far the most extended, systematic, and successful, effort yet made in this interesting field of experimental inquiry. I am indebted to the politeness of Mr. Bull for permission to transcribe the tabular results of his experiments, and such other portions of his interesting paper as more immediately comports with the practical character and design of this work; but would earnestly recommend the perusal of the whole paper to every scientific manufacturer, or artisan, whose processes involve any considerable consumption of fuel, as well as to enlightened readers of every class; for no subject is more generally interesting in our cold climate than the most economical means of producing artificial heat.

The general principle on which Mr. Bull's experiments were conducted, for determining the comparative heat evolved in the combustion of the different varieties of fuel operated on, was to burn them in a close room, and note the time that the combustion of a given weight of each would sustain the air of the room at a temperature of 10° above the surrounding medium. To obviate the influence which the ordinary atmospheric changes of temperature and the winds would produce on the results, by furnishing a surrounding "refrigerating medium of inconstant power," the room in which the experiments were performed was surrounded by double walls, and the intermediate space sustained by artificial heat during the experiments, at a uniform temperature, and somewhat higher than the greatest natural temperature of the external atmosphere. The actual temperature of the inner and the outer rooms, during the experiment, was determined by common mercurial thermometers suspended in each, and the difference of temperature by Leslie's differential thermometer, the horizontal part of which traversed the inner wall, or partition, leaving a bulb and upright stem on each side. The combustion was effected in a small upright cylindrical stove furnished with forty-two feet of sheet iron pipe of two inches diameter, having in it several convolutions before it left the room.

So completely was the heat generated in the process of combustion dissipated by the pipe, and emitted into the room, that a thermometer, the bulb of which was inserted in the pipe just before it entered the chimney, indicated the same temperature as the one which hung in the room. As the conducting power of air, in relation to caloric, is influenced by its hygrometric state, care was taken to preserve it in a uniform condition in this respect. All the varieties of fuel operated on were dried previous to combustion, at a temperature of 250°, Fahrenheit. Their solid contents were determined in the usual method for irregular bodies, by the volume of water which a given volume by the usual admeasurement displaces, and the specific gravities by the hydrostatic balance. In the latter case, porous substances, which expand by the absorption of water, as the wood, were previously covered with a varnish having exactly the same specific gravity as water; in short, no precaution seems to have been omitted by this laborious and able experimenter, to guard against every source of error, both in the construction of his apparatus, and in the general conduct of his inquiries. The annexed table exhibits the results of his experiments on sixty-six varieties of fuel.

On the first inspection of the annexed table I was surprised, as I presume others have been, at the general aspect of the 10th column in relation to the wood. The difference in the heat produced by the combustion of equal weights of dry woods is much less than I had apprehended, and such as to induce a momentary suspicion of the general accuracy of the results. The extreme times in which given weights of forty-six varieties of dry woods sustained a temperature, in the inner room, of 10° above the surrounding medium, are only as 9 to 10. If we turn to the 5th column, we observe a remarkable coincidence between the weight of charcoal, which each variety of wood yields, and the heat produced by combustion. This correspondence is noticed by Mr. Bull. It is not exact, but sufficiently so to justify the inference, that the small difference in the actual value of fuel, as determined by the heat emitted on combustion, is mainly attributable to variations in the quantity of carbon they contain. As the results in these two columns were obtained by actual experiment, and by processes entirely dissimilar, the coincidence noticed affords a strong confirmation of the general correctness of both.

Woods and Coals.		Specific gravities of dry wood.	Avoird. lbs. of dry wood in 1 cord.	Product of charcoal from 100 parts dry wood, by weight.	Specific gravities of dry coal.	Pounds of dry coal in one bushel.	Lbs. charcoal from 1 cord of dry wood.	Bushels of charcoal from 1 cd. dry wood.	Time 10° Heat were maintained by the combustion of 1 lb. of each article.		Value of specified quantity of each article, compared with shell-bark hickory.
Common Names.	Botanical Names.								H.	M.	Cord.
White Ash	Fraxinus americana	.772	3450	25.74	.547	28.78	888	31	6	40	77
Apple Tree	Pyrus malus	.697	3115	25	.445	23.41	779	33	6	40	70
White Beech	Fagus sylvestris	.724	3236	19.62	.518	27.26	635	23	6		65
Black Birch	Betula lenta	.697	3115	19.40	.428	22.52	604	27	6		63
White Birch	Betula populifolia	.530	2369	19	.364	19.15	450	24	6		48
Butter-nut	Juglans cathartica	.567	2534	20.79	.237	12.47	527	42	6		51
Red Cedar	Juniperus virginiana	.565	2525	24.72	.238	12.52	624	50	6	40	56
American Chesnut	Castanea vesca	.522	2333	25.29	.379	19.94	590	30	6	40	52
Wild Cherry	Cerasus virginiana	.597	2668	21.70	.411	21.63	579	27	6	10	55
Dog Wood	Cornus florida	.815	3643	21	.550	28.94	765	26	6	10	75
White Elm	Ulmus americana	.580	2592	24.85	.357	18.79	644	34	6	40	58
Sour Gum	Nyssa sylvatica	.703	3142	22.16	.400	21.05	696	33	6	20	67
Sweet Gum	Liquidumbar styraci flua	.634	2834	19.69	.413	21.73	558	26	6		57
Shell-bark Hickory	Juglans squamosa	1.000	4469	26.22	.625	32.89	1172	36	6	40	100
Pig-nut Hickory	Juglans porcina	.949	4241	25.22	.637	33.52	1070	32	6	40	95
Red-heart Hickory	Juglans laciniata ?	.829	3705	22.90	.509	26.78	848	32	6	30	81
Witch Hazel	Hamamelis virginica	.784	3505	21.40	.368	19.36	750	39	6	10	72
American Holly	Ilex opaca	.602	2691	22.77	.374	19.68	613	31	6	20	57
American Hornbeam	Carpinus americana	.720	3218	19	.455	23.94	611	25	6		65
Mountain Laurel	Kalmia latifolia	.663	2963	24.02	.457	24.05	712	30	6	40	66
Hard Maple	Acer saccharinum	.644	2878	21.43	.431	22.68	617	27	6	10	60
Soft Maple	Acer rubrum	.597	2668	20.64	.370	19.47	551	28	6		54
Large Magnolia	Magnolia grandiflora	.605	2704	21.59	.406	21.36	584	27	6	10	56
Chesnut White Oak	Quercus prinus palustris	.885	3955	22.76	.481	25.31	900	36	6	30	86
White Oak	Quercus alba	.855	3821	21.62	.401	21.10	826	39	6	20	81
Shell-bark Wh. Oak	Quercus obtusiloba ?	.775	3464	21.50	.437	22.99	745	32	6	20	74
Barren Scrub Oak	Quercus catesbæi	.747	3339	23.17	.392	20.63	774	38	6	30	73
Pin Oak	Quercus palustris	.747	3339	22.22	.436	22.94	742	32	6	20	71
Scrub Black Oak	Quercus banisteri	.728	3254	23.80	.387	20.36	774	38	6	30	71
Red Oak	Quercus rubra	.728	2254	22.43	.400	21.05	630	30	6	20	69
Barren Oak	Quercus ferruginea	.694	3102	22.37	.447	23.52	694	29	6	20	66
Rock Chesnut Oak	Quercus prinus monticola	.678	3030	20.86	.436	22.94	632	28	6		61
Yellow Oak	Quercus prinus acuminata	.653	2919	21.60	.295	15.52	631	41	6	10	60
Spanish Oak	Quercus falcata	.584	2449	22.95	.362	19.05	562	30	6	20	52
Persimon	Diospyros virginiana	.711	3178	23.44	.469	24.68	745	30	6	30	69
Yellow Pine (soft)	Pinus mitis	.551	2463	23.75	.333	17.52	585	33	6	30	54
Jersey Pine	Pinus inops	.478	2137	24.88	.385	20.26	532	26	6	40	48
Pitch Pine	Pinus rigida	.426	1904	26.76	.298	15.68	510	33	6	40	43
White Pine	Pinus strobus	.418	1868	24.35	.293	15.42	455	30	6	40	42
Yellow Poplar	Lyriodendron tulipifera	.563	2516	21.81	.383	20.15	549	27	6	10	52
Lombardy Poplar	Populus dilatata	.397	1774	25	.245	12.89	444	34	6	40	40
Sassafras	Laurus sassafras	.618	2762	22.58	.427	22.47	624	28	6	20	59
Wild Service	Aronia arborea	.887	3964	22.62	.594	31.26	897	29	6	20	84
Sycamore	Acer pseudo-platanus	.535	2391	23.60	.374	19.68	564	29	6	30	52
Black Walnut	Juglans nigra	.681	3044	22.56	.418	22	687	31	6	20	65
Swamp Whortleberry	Vaccinium corymbosum	.752	3361	23.30	.505	26.57	783	29	6	30	73
											Ton.
Lehigh Coal		....	....	.....	1.494	78.61	....	....	13	10	99
Lackawaxen Coal		....	....	.....	1.400	73.67	....	....	13	10	99
Rhode Island Coal		....	....	.....	1.438	75.67	....	....	9	30	71
Schuylkill Coal		....	....	.....	1.453	76.46	....	....	13	40	103
Susquehanna Coal		....	....	.....	1.373	72.25	....	....	13	10	99
Swatara Coal		....	....	.....	1.459	76.77	....	....	11	20	85
Worcester Coal		....	....	.....	2.104	110.71	....	....	7	50	59
											100 bbls
Cannel Coal		....	....	.....	1.240	65.25	....	....	10	30	230
Liverpool Coal		....	....	.....	1.331	70.04	....	....	9	10	215
Newcastle Coal		....	....	.....	1.204	63.35	....	....	9	20	198
Scotch Coal		....	....	.....	1.140	59.99	....	....	9	30	191
Karthaus Coal		....	....	.....	1.263	66.46	....	....	9	20	208
Richmond Coal		....	....	.....	1.246	65.56	....	....	9	20	205
Stony Creek Coal		....	....	.....	1.396	73.46	....	....	9	50	243
Hickory Charcoal		....	....	.....	.625	32.89	....	....	15		166
Maple Charcoal		....	....	.....	.431	22.68	....	....	15		114
Oak Charcoal		....	....	.....	.401	21.10	....	....	15		106
Pine Charcoal		....	....	.....	.285	15	....	....	15		75
Coke		....	....	.....	.557	29.31	....	....	12	50	126
Composition of two parts Lehigh Coal, one Charcoal, and one Clay, by weight		....	....	.....	....	.....	....	....	13	20	

The eight first columns of figures, in the above general table, contain the results of actual experiments, for the details of which I must refer the reader to Mr. Bull's work. The last column is obtained by calculation. Mr. Bull found that shell-bark hickory has the greatest specific gravity of all the varieties of wood experimented on, (as indicated in the table;) and, as an equal weight of it was observed to maintain a given temperature in the room as long a time as any other, it follows that a cord of this wood would yield the greatest amount of heat in combustion: assuming, therefore, the specific gravity of shell-bark hickory to be 1.000, and its value as 100, the value of the other woods must be in the compound ratio of their respective specific gravities, and the time which a given weight was found to sustain the required temperature, and is given in decimal expressions of this last number. On this subject Mr. Bull observes, "that although shell-bark hickory has been taken, for convenience, as the standard to construct the column of comparative values, the economist should take the cheapest article of fuel in the market, as his standard of comparison."

If we assume the average quantity of charcoal yielded by the dry woods to be 20 *per cent.* by weight, and the average time that a pound of dry wood sustained a temperature of 10° above the surrounding medium, in Mr. Bull's experiments, to be six hours (both of which terms are below the truth, but which sustain to each other about the ratio which we observe between the 5th and 10th columns in his table,) it results that just 50 *per cent.* of the heat emitted in the combustion of dry wood is to be attributed to the combustion of the carbon which it contains: for one pound of charcoal sustained the temperature of the room, at the required point, just two and a half times as long as the assumed average time that a pound of wood would do, which yields 20 *per cent.* of charcoal, and $.20 \times 2.5 = .500$.

The following remarks of Mr. Bull are full of interest to the economist of fuel. "From experiments made to ascertain the weight of moisture absorbed by the different woods, which had previously been made perfectly dry, and afterwards exposed in a room in which no fire was made during a period of twelve months, the average absorption by weight, for this period, was found to be 10 *per cent.* in forty-six different woods, and 8 *per cent.* in the driest states of the atmosphere; and an unexpected coincidence was found to exist in the weight absorbed by forty-six pieces of charcoal, made from the same kinds of wood, and similarly exposed, the latter being also 8 *per cent.*

"The quantity of moisture absorbed by the woods individually was not found to diminish with their increase in density; whilst it was found that the green woods in drying uniformly lost less in weight in proportion to their greater density. Hickory wood, taken green, and made absolutely dry, experienced a diminution, in its weight, of 37½ *per cent.*, white oak 41 *per cent.*, and soft maple 48 *per cent.* A cord of the latter will, therefore, weigh nearly twice as much when green as when dry.

"If we assume the mean quantity of moisture in the woods, when green, as 42 *per cent.*, the great disadvantage of attempting to burn wood in this state must be obvious; as in every 100 pounds of this compound of wood and water, 42 pounds of aqueous matter must be expelled from the wood, and as the capacity of water for absorbing heat is nearly as 4 to 1 when compared with air, and probably greater during its conversion into vapor, which must be effected before it can escape, the loss of heat must consequently be very great.

"The necessity of speaking thus theoretically, upon this point, is regretted; but it will be apparent that this question of loss cannot be solved by my apparatus, as the vapor would be condensed in the pipe of a stove, and the heat would thereby be imparted to the room, which, under ordinary circumstances, escapes into the chimney."

If we adopt the statement of Mr. Tredgold, that 8.49 pounds of Newcastle coal will convert one cubic foot, or 62½ pounds, of water, into steam, under common pressure of the atmosphere, which is probably correct, Mr. Bull's table furnishes the remaining necessary *data* for a more accurate determination of the loss sustained in burning green wood. Take, for example, 100 pounds of green white oak, which Mr. Bull found to contain 41 pounds of moisture: according to Mr. Tredgold, 41 pounds of water require 5.51 pounds of Newcastle coal for conversion into vapor. Now we have the relative values of oak wood and Newcastle coal, as it regards their power of producing heat, in the 10th column of Mr. Bull's table: 1 pound of white oak maintained 10° of heat in the room six hours and twenty minutes, and one pound of Newcastle coal nine hours and twenty minutes. We have then this proportion, as 380′: 560′:: 5.51: 8.12 pounds of dry oak, consumed in converting 41 pounds of water into steam; or, in other words, 13¾ *per cent.* of the combustible matter of green oak is employed in boiling away its own water, and, in all ordinary cases, is a dead loss. It is true that arrangements might be made by a very protracted iron pipe, as in the stove used by Mr. Bull in his experiments, and other contrivances, for condensing the steam thus formed from green wood, and recovering both the latent and the sensible heat of the steam; but such an apparatus would be attended with too many inconveniences to be adopted in our dwelling houses, and would be perfectly impracticable in large fires in the arts, where the flue is necessarily kept at a temperature above boiling water, and where, of course, the steam could not condense.

In the foregoing estimate of the loss of heat by the combustion of green wood, I have considered the subject in a theoretical point of view; or, at least, only in relation to those operations which have for their object the diffusion of heat in the air of apartments. But in most of the arts the object is the reverse of this,—to produce a strong and *circumscribed* heat. In these cases there is not only an entire loss of that portion of caloric which escapes in the steam from most fuel, (for it cannot be recovered, even if subsequently condensed, to any efficient purpose,) but if the temperature fall, in consequence of this loss of caloric in the steam, below the required point, there must be a total loss of the whole fuel. I suspect that it would be quite impossible for our glass manufacturers and iron founders to procure the intense heat required in their furnaces with the use of green wood. I have noticed at several glass-houses, and the practice is probably general, that the weather seasoned pine wood is dried, or rather baked, by a stove heat, at a temperature that not unfrequently ignites it before it is used. I think it not unlikely that this practice might, in many instances, be profitably extended to the ordinary fuel (pine wood) used for steam boilers in our river boats; or, in other words, that a portion of the fuel might be economically expended in drying the remainder preparatory to use. Mr. Bull estimates the average quantity of moisture, in woods which have been weather seasoned from eight to twelve months, at about 25 *per cent.* of their weight. It may be objected to this suggestion, that although stove-drying may be indispensable where the attainment of a certain high degree of heat is absolutely necessary to the success of the process, yet where this necessity does not exist, the water may be as cheaply dissipated by the absorption of the caloric in the ordinary combustion, as by burning a portion of the fuel separately for that object. To this it may be replied, that the effective heat imparted to steam boilers is not, as is generally supposed, in a direct ratio to the quantity of caloric emitted by the burning fuel, but more nearly in proportion to the elevation of the temperature in the fire-place above that of the water within the boiler. The vapor formed by a fire that shall only elevate the temperature of the water to within a few degrees of the boiling point, say to 200°, bears a very small proportion to that which is produced at 212°; so that it is quite easy to burn a considerable quantity of fuel under a boiler to almost no practical effect. To pursue this subject into the causes of these results would lead to a theoretical disquisition on the laws which govern the communication of heat, foreign to the object of this work.

The great superiority assigned by Mr. Bull to the Lehigh and other anthracite coals, not only over wood but the best English coals, has also excited some doubt, and particularly with us at the north, of the accuracy of the comparison; but this, it may reasonably be supposed, is attributable to a mistake, against which Mr. Bull has warned us in his treatise, that of comparing his results with common experience derived from the very imperfect arrangements for the consumption of this fuel, both in the arts and in our dwellings. Its introduction is of too recent a date to have diffused correct information on this subject, and doubtless we have yet much to learn as to the best methods of applying it to many purposes in the arts.

"The composition balls of Lehigh coal, charcoal, and fire clay," Mr. Bull observes, "were made for the purpose of ascertaining whether a very economical fuel might not be formed of the culm, or fine portions, of the two former, by combining them with the latter article, as they possess very little value: the same practice having been adopted with considerable advantage in various parts of Europe. The fire produced by these balls was found to be very clean and beautiful in its appearance. Its superior cleanliness is in consequence of the ashes being retained by the clay, and the balls were found to contain their original shape after they were deprived of the combustible materials. The beauty of the fire is enhanced by the shape and equality in the size of the balls, which during the combustion present uniform luminous faces. No difficulty was found in igniting, or perfectly consuming, the combustible materials, and the loss in heat, when compared with the combustion of the same quantity of each article in their usual states of aggregation, was found to be only three per cent." I think there must be an error, probably a typographical one, in carrying out the result of the combustion of this mixture in Mr. B.'s table: allowing the anthracite and charcoal to yield the same heat as assigned to them when burned separately in the aggregate form, they should have sustained the same temperature only ten hours and twenty minutes.]

MORNING.—At the morning's dawn, when nature, refreshed by the dews of night, smiles around and revives afresh, she cries aloud—'O, mortal! Why art thou a prey to care and anxiety? Is not God thy father? Shall he who made thee forsake his child? The term of thy existence is not confined to thy pilgrimage on earth, it extends to eternity?'—[Atlas.]

The following is from the APPRENTICE'S COMPANION, a small work just commenced in this city by the proprietor of the FARMER; designed expressly for young men—and especially for mechanics' apprentices. It is to be published once a month, *at 50 cts. per annum.*

MY object, in publishing this little work, is to be of service to those young men who are *now*, or may hereafter be, APPRENTICES; but who, in a few years, will be the active mechanics of the country.

My aim will be to give them a *just* idea of, and to teach them duly to appreciate their situation *as*, apprentices; and at the same time to point out the only *sure*, and honorable, way by which they may become good mechanics, respectable citizens, and highly esteemed members of society. A grand and leading object with me will be to impress upon them the importance of TEMPERANCE, INDUSTRY, FRUGALITY, and PERSEVERANCE; and in order to do it more forcibly, I shall illustrate their importance, by giving examples with which I am familiar; and incidents, as well from observation, as from history; and which will occur again, and again, as long as the relation of master and apprentice shall exist.

It is of great importance to a man, and especially a *young* man, when commencing a long journey, to know something of the road he is to travel. He cannot, indeed, be too well acquainted with its course, or with the difficulties to be encountered. So with the inexperienced youth, who leaves the parental, or guardian roof, or the penniless orphan, when about to leave the asylum in which he found a shelter from the buffetings of a pitiless world—he ought to know something of the duties of the station he is designed to fill, before he enters upon it; as well as the best and surest mode of rendering himself contented, happy, and useful; and, at the same time, secure the confidence, good will, and affection, of those with whom he resides, and associates; thereby accomplishing two important objects at the same time, viz. the acquiring of a trade, or profession, and securing good friends, who may be willing to aid him into business, should he,—as most young men, who learn trades, do,—need it. It should be always distinctly borne in mind by young men, that a good character,—that is, an established character for *industry*, *frugality*, and *perseverance*, and, above all, for TEMPERANCE,—is better, far, than a capital without it; as with *such* a character he can obtain capital or credit at any time—whereas, without it, a capital would probably soon be squandered.

It is a mistaken idea, yet one generally entertained by boys, that men, *business* men, with whom they have no immediate intercourse, *take no notice of their conduct*. This is altogether a mistaken notion, and the parent, I have no doubt, of much mischief—or neglect of duty, and dissipation. In this matter I speak from experience—as I shall in many others—having been apprentice, journeyman, and master, and from having conversed upon the subject, both with the man of business and the apprentice, and think I cannot be mistaken. It will therefore be a leading object to convince those for whom this work is designed, that their conduct is always a subject of observation by, and frequently of *remark* among, men in stations far above them, and who have no direct interest in their welfare; and that *such* opinions of them, formed from their conduct, by such men, have a lasting influence upon their feelings towards them, for good, or for evil, in after life; and that it is, therefore, of the utmost importance to every apprentice, so to conduct as to have, not only the good will and confidence of his employers and immediate friends, but the respect of *every man* with whom he may become acquainted, or to whom he may be known, *even by sight*.

Another leading feature in the publication will be, to point out the evils of IN-temperance, especially upon mechanics; and some of the causes which bring this worst of afflictions upon innocent families; together with a view to guard the apprentice, if possible, against habits and practices so common—or were so, a few years since,—in many respectable shops, to wit, requiring every apprentice or journeyman to *treat the inmates, on entering or leaving a shop*—and frequently at other times, in the absence of the master,—from which practice a premature grave has been found by many a promising young man.

As much benefit may result from placing meritorious examples before young men, a part of each number will be devoted to memoirs and biography of mechanics and others, who have, from poverty and obscurity, risen to wealth, and stations of high respectability and eminence, by *industry, economy, and devotion to the pursuit in which they engaged*. In short, to persuade them that "WHAT MAN HAS DONE, MAY, BY MAN, BE DONE AGAIN." The largest portion, however, of the work, will be devoted to subjects in mechanics, illustrated with engravings, of utility and interest to those engaged in such pursuits. It will, in short, be my whole aim to make it a work of practical utility to the *rising generation* of mechanics, with a hope of being useful to many young men, now just commencing their career, who, like myself, have been wholly dependent upon their own exertions for success in after life; and to put it at such a price as will enable every apprentice to possess it—or induce every master, from motives of economy, *if from no other*, to obtain a copy for each of his apprentices.

Hints to Young Men, or Enterprise and Speculation Contrasted.

Whatever lessons we may be taught to make us despise wealth, by those who wish to get it from us, *poverty* is an evil, which it is the duty of every one, by all honorable means, to avoid; and whoever points out a safe way to wealth, or even to competency, without impoverishing or interrupting any one else in the same pursuit, does an essential service, not only to the one who profits by his instructions, but to the whole human family.

But there are two ways of acquiring wealth, not only essentially different, but as opposite to each other as east is opposite to west. One of these ways may be properly denominated *enterprise*, the other *speculation*. The first of these ways creates the wealth it accumulates by bringing into existence the articles of which it is composed, or by increasing the value of articles which existed before; the other draws the wealth, generally, by some kind of deception or delusive pretences, out of the possession of its right owner, without increasing its value, or adding any thing to the public stock. The first of these modes is honest, and highly laudable: as it adds to the general stock of human happiness, by increasing the means, without lessening those of any individual. The second mode, however it may be tolerated, and even applauded, is in itself wholly dishonest, and subversive to the peace and happiness of mankind, because in the same ratio that it makes one richer it makes others poorer, thereby disturbing that equal distribution of property acquired by honest industry, which forms the basis of human happiness; not that visionary levelling distribution, which would give every one an equal amount, but that which secures to every one the equal right of possessing what is his own.

But what seems paradoxically strange is, that while enterprise opens a thousand doors which lead to her treasures, and courts the hand of industry to partake of them in almost unlimited profusion—while every step of the path through which she leads, when aided by the light of reason, and instructed by prudence, may be truly said to be strewed with pleasure, and to lead to wealth—and when, on the other hand, the path of speculation is at best precarious, often leading to ruin, and its travellers always exposed to the stings of conscience, and, what is still worse, the objects of speculation appear to be nearly exhausted,—yet still the public mind appears to be nearly blind to enterprise, and to cling to speculation as drowning persons cling to a floating substance.

But the human character, in nearly all its varieties, owes its peculiarities to accidental circumstances. Examples produce imitation—imitation repeated produces habit—and habits confirmed produce the character. At the close of the war of independence, even the name of speculation was scarcely known in this country. But the sudden impulse of freedom and peace together operating as a powerful stimulus, awakened the spirit of speculation, while that of honest enterprise, fatigued by the toils of war, still slept. The state of society was unsettled, and valuable property was afloat. The regular channels of commerce became the polluted sewers of speculation. The wretched pittances of the war-worn soldier were swept into the pockets of the speculator, and the bread of the poor became taxed to increase the wealth of the forestaller. Thus speculation became the order of the day, and the public taste soon becomes reconciled to whatever is fashionable.

But evils generally tend to their own remedy, and so they have done in this case. A few have acquired wealth by speculation, and many have been reduced to poverty by it. Vast numbers have not only ended their own career, but have involved their friends and connexions in remediless ruin. But the harvest of general speculation being now principally reapt, and even almost every scattering straw in the field carefully gleaned, the recollection of disasters, and the unfavorable aspect of chances, have rendered the business somewhat unpopular, and rather cautiously and doubtfully engaged in, except in those great establishments where it is scientifically conducted, —where, aided by all the ingenious machinery of stock-jobbing, many great and wise men of the nation are making independent fortunes by speculating in nothing at all. But this sublime "*art, trade, or mystery*," is not obtained without great difficulty; and therefore it is that our young men, having little or no farther confidence in speculation, and still deaf to the invitations of enterprise, are heard complaining of hard times, and the want of subjects of speculation.

At this crisis, believing, as I do, that enterprise, guided by prudence and supported by industry, is the only honest means of obtaining wealth, that its sources are innumerable and inexhaustible, I feel in duty bound, as far as my mite of influence can extend, to persuade the young men of our country, instead of bewailing the hardness of the times, to awaken from that lethargy into which the spirit of speculation has sunk them, and turn their attention to a thousand avenues which lead to wealth, respectability, and happiness. I am confident and sincere in the opinion, that in the present happy state of our nation, with a government which secures every one the possession of equal rights, without grievous taxation—where almost countless millions of acres of the richest soil are courting the hand of cultivation—where the useful mechanic arts possess an unlimited field of encouragement,—and where the value of science is duly appreciated,—if any young man, with common faculties, long continues poor, it must be from want of knowledge, from want of energy, or from want of a disposition to be otherwise.

With these views, I have determined to offer to the young men of the United States, through the medium of the press, in a series of four numbers, such plain and simple plans, both agricultural and mechanical, and perhaps commercial, as, if perseveringly pursued, cannot fail of being successful. These plans will be adapted to different tastes, and to minds of different capacities. Minds, like bodies, possess different degrees of strength. Some minds can wield and manage with ease plans of vast magnitude and importance, while others, of equal consequence in the scale of being, are on a more limited scale. Tastes also differ as much as capacities. That plan of business, which would be congenial and delightful to one taste, would often be disgusting to another. The man whose head teems with intricate and puzzling mechanical combination, would often pursue, with ardent and persevering industry, to successful and useful termination, a project which would appear incomprehensible and insipid to another of equal capacity, but of a different taste: another, who delighted in contemplating and improving the beauties of nature, would shine as an agriculturist, but would make an awkward mechanic. The best talents are often rendered worse than useless by being misplaced. To avoid this, I shall endeavor to give plans suited to different tastes, and of different magnitudes, but which shall all tend to the benefit of the great whole, by producing wealth, and not drawing it away from others, without giving an equivalent. I have not

the vanity to consider myself wiser than other people, but the plans I shall give have been drawn from many years' observation, with a strong desire at least to benefit somebody, if not myself; and if they produce no other good, I shall hope the hints I shall give will induce some abler pens to give better ones, or at least to expose their fallacy. PHILANTHROPOS.

The following extract, although written many years since, and by a hand unknown to me, is well worthy the attention of every young man. It is not the station in which a boy finds himself, but his *conduct*, which is to determine what shall be his *rank* in life.

Observations on Obscurity of Birth.

In a republican and in every free government, where merit, and not favor, is the ladder by which we mount to preferment, "virtue alone is true nobility." Why then do mankind rail at each other for obscurity of birth? Are they not originally descended from the same parents? Have not some of the first generals the world ever produced, been men of obscure birth. A shoemaker's son protected Athens against hosts of armed allies. The son of a blacksmith resisted the all-powerful charms of gold, while his eloquence revived the drooping spirits of his countrymen, and made the potent king Philip acknowledge, "he did him more harm than all the armies and fleets of the Athenians."

But why such obscure examples? Cincinnatus was a ploughman, and Franklin was a printer. The one was thrice invested with unlimited authority by his countrymen, and restored the tottering state of Rome. The other disarmed the artillery of heavenof its force, and his mind, like a mirror, has been said to reflect upon the Deity "a miniature picture of his own works."

It has been said, the poorer class of people are more debauched in their principles—have not the opportunities of gaining knowledge, that the rich have,—and of consequence should have no share in the government. Does experience or example warrant the assertion? No, there is no foundation in nature for it. It exists only in the mind of him who uttered it: there let the phantom die.

EDUCATION OF MECHANICS.—"If he can read and write, and cypher as far as the rule of three, he has learning enough for a *farmer* or *mechanic*," is not an uncommon expression. Is it indeed so? Are mechanics and farmers, who can "read and write, and cypher as far as the rule of three," well enough informed? Do they not, in the first place, furnish the whole human family with the *necessaries* of life? Why, then, should they not be as well informed as those who furnish the *superfluities* of life? Those who contribute, rather to our imaginary, than to our real, wants? Are not the mechanics and agriculturists the most numerous classes of community? Have they not the superintendence and management of much the largest portion of the *rising generation?* And who, more than the *guardians* of those who are to succeed the present generation, should be intelligent? So far, indeed, from the truth and justice of the remark, as applied to those classes, I believe it could not be more *mis*-applied; and being deeply impressed with this opinion, it will be my aim to show the young men who may do me the favor to read this work, the importance and necessity of improving every leisure moment in acquiring information; and at the same time, endeavor to point out a way by which they may acquire education, without interfering with their business; and thereby become what *they should be, leading members of community.*

It is now becoming *fashionable*—and it must, of course, on *that* account, if on no other, succeed,—to introduce mechanical and agricultural employment into schools and colleges, as will be seen by the annexed extract from an article on "MANUAL LABOR COLLEGES," in that valuable periodical, the "American Annals of Education."

The following views embodied in the laws of Bristol College, express the sentiments entertained by the Corporation:

"In regard to manual labor, or exercise in the college shops, gardens, and farms, as an important, if not an essential part of a thorough and truly liberal and valuable education, the sentiment of Plato is adopted as fundamental: that it 'ought to be everywhere maintained, that a GOOD EDUCATION imparts to the MIND and BODY all the power, all the beauty, and all the perfection of which they are capable.'

"The Physical Department of Education in this Institution shall be entitled to an equal degree of attention and supervision from the Board of Trustees and the faculty, with the Intellectual—with this difference, that the exercise of the former shall be considered as subserving and promoting those of the latter, while both are considered as parts of a good education, and, in the prescribed course of this Institution, not to be dispensed with."

The College of South Hanover, in Indiana, has also been organized on the plan of manual labor. This Institution, which commenced in a log cabin, now has a spacious edifice, filled with two hundred students, under the care of six instructors, whose *health has been almost uninterrupted*, while disease has visited neighboring places in the most alarming manner. The trustees state, that they have a mechanical establishment which will give employment to fifty or sixty students, two hours in the day; that industrious young men may earn from ten to fifteen dollars per session, without any interruption to their studies; and those who are familiar with any trade, more than this. From *boys* under fifteen, and especially those bred in indolence, they promise little. Such, we think, ought not to leave the paternal roof; for to those bred in indolence, a college life is ruinous. Board may be had at one dollar per week.

There cannot be a doubt of the utility of such institutions, properly conducted, to those who select the learned professions for their pursuit—nor can a reasonable or intelligent man deny the importance of *intelligence* and virtue amongst mechanics and farmers, to insure the permanence of our invaluable institutions; for it is to them, after all, that we are to look for safety.

Extract from an Essay on Industry.

This is a country which affords all the means, not only of subsistence, but of wealth. But means must be applied, or the end is not attained. Greater industry may be necessary here, than in some other climes; but this is no unhappiness. A people, that grow rich suddenly, and without much labor, soon become luxurious and effeminate. They presently sink again into poverty: or their wealth is confined to a few. They lose their strength, and vigor, and the spirit of liberty; and fall an easy prey to the first powerful invader, or ambitious usurper. A habit of industry is first acquired by necessity: and, once acquired, it may continue for a while, after the necessity abates, unless circumstances alter too suddenly. It strengthens the body, braces the mind, and aids other virtues. It gives patience in adversity, courage in danger, and perseverance in difficulty. No people ever maintained their liberty long, after they ceased to be industrious, and became dissolute and luxurious.

Anecdote.

A certain English Philosopher pretended, in opposition to Dr. Franklin, that blunt conductors were the only safe ones. The king of Great Britain, during the war, changed the sharp conductors of his palace into blunt ones, as though he disdained to owe his safety to an enemy's invention. This he persisted in, notwithstanding the Royal Society's public condemnation of the pretended improvement. This anecdote caused the following epigram:

> While you, great George, for safety hunt,
> And sharp conductors change for blunt,
> The nation's out of joint.
> Franklin a wiser course pursues;
> And all your thunder fearless views,
> By keeping to the point.

The following memoir is given as the first of a series, by way of showing young men "what has been done," and therefore "WHAT MAY BE DONE AGAIN."

No. 2 will contain a memoir of, as he has been often called, "the *self-taught* SHERMAN."

I cannot, however, give this number of the "Companion" to my young mechanic friends, without giving them—at the same time that I would urge them onward to all that is virtuous, manly, and noble—a word of *caution;* not, by *over-estimating their abilities*, to let "fancy, or excited feelings, lead" them into pursuits for which they are wholly unqualified. I cannot so well express my views on the subject, as I find them expressed in the following extract from the introductory essay to a small work styled "Biography of Self-taught Men," from which the annexed memoir is taken.

"To the numerous class of young men in the United States, who are mainly dependent on their own resources for knowledge, or respectability, one of the most important counsels of wisdom, which can be addressed, is, STUDY YOUR OWN CHARACTER AND PROSPECTS. If you are just emerging from obscurity, and breathing the fresh air of an emancipated mind, and thirsting for improvement, and occasionally catching some gleams of light from that undiscovered land of promise, which lies in the distant horizon; let not your fancy, nor your excited feelings, lead you captive. Be calm and considerate. A wrong step now may blast your hopes forever. An imperfect estimate of the deficiencies of your character, may impede your course through your whole subsequent life. Be willing to know all the wrong habits which you have cherished, and all the weaknesses of your mind."

To this advice the most careful attention should be given. It should also be recollected, that the *main* business of life should be, *to be useful to mankind.*

WILLIAM WHIPPLE.—The father of Whipple was a native of Ipswich, Massachusetts, and was bred a maltster. He was also, for some time, engaged in seafaring pursuits. He married Mary, the eldest daughter of Robert Cutt. She was a lady of excellent sense, and of many pleasing accomplishments. William Whipple was born in Kittery, Maine, in the year 1730. He received his education in one of the public schools in that town, where he was taught reading, writing, arithmetic, and navigation. When

this deficient course of education was completed, he left school, and immediately embarked on board of a merchant vessel, for the purpose of commencing his destined profession as a sailor. Before he was twenty-one years of age, he obtained the command of a vessel, and performed a number of voyages to Europe, and the West Indies. He was afterwards engaged in the infamous slave traffic. This circumstance in his life admits of no justification. The fact that good men formerly participated in it, only proves how much avarice hardens the human heart, and sears the natural conscience. In 1759, Mr. Whipple abandoned the sea, and engaged in mercantile business for some time, with his brother Joseph. He married his cousin, Catharine Moffat, daughter of John Moffat, Esq., a merchant of Portsmouth. At an early period of the revolutionary contest, Mr. Whipple took a decided part in favor of the colonies, and in opposition to the claims of the parent country. So much confidence was placed in his integrity and firmness, that his fellow citizens frequently placed him in highly important offices. In January, 1775, he was chosen one of the representatives of Portsmouth, to the provincial congress, which met at Exeter. By that body he was elected one of the provincial committee of safety. In 1776, he was chosen a delegate to the General Congress, which met at Philadelphia. He continued to be re-elected for the three following years. This appointment gave Mr. Whipple the opportunity to record his name among the memorable list of the signers of the Declaration of Independence. The cabin boy, who, thirty years before, had looked forward to the command of a vessel, as the consummation of his hopes, now stood among a band of patriots, more illustrious than any which the world had yet seen. He was considered a very useful and active member. In the business of committees he displayed a most commendable degree of perseverance, ability, and application. In 1777, when Burgoyne was rapidly advancing from Canada, the assembly of New-Hampshire was convened, and more decisive measures were adopted to defend the country. Two brigades were formed; the command of one of which was given to Gen. Stark, and the other to Whipple. Whipple was present with his brigade at the battles of Stillwater and Saratoga. He was one of the commissioners appointed by Gates to treat with Burgoyne, and was afterwards selected to conduct the British troops to Boston.

He was accompanied on this expedition by a negro servant named Prince, whom he had imported from Africa. On his way to the army, he told his servant that if they should be called into action, he expected that he would behave like a man of courage. Prince replied, "Sir, I have no inducement to fight; but if I had my liberty, I would endeavor to defend it to the last drop of my blood." The general emancipated him upon the spot. In 1778, he accompanied Gen. Sullivan in his expedition to Rhode Island. For more than two years he was receiver of finance, a most arduous and responsible office, under Robert Morris. About this period, Gen. Whipple began to be afflicted with severe strictures in the breast, which compelled him to decline any further military command. In 1782, he was appointed one of the judges of the superior court of New-Hampshire, in which office he continued till his death. In November, 1785, he expired, in consequence of an ossification of the heart. He was in the fifty-fifth year of his age.

On the whole, he seems to have been a very useful man in a period abounding in distinguished talent. The variety of offices which he filled with propriety and ability, is not a little remarkable. Master of a vessel—merchant—leader of militia-men—an interpreter of the old confederation and of the laws of his native State, and a committee-man in Congress. He had but little education in the schools. *He taught himself.* His powers of observation on men and things were turned to the best account. In his manners, Gen. Whipple was courteous and affable, and he appears to have possessed an estimable character for integrity, and general morality.

From the "Mechanics' Magazine and Register of Inventions and Improvements."]

We are indebted to the politeness of Dr. Bartlett, editor of the Albion, for the following drawing and description of a Rotary, or "*Gravitating* Rotary Engine." It is singular in its construction, although not new to us in the application of the steam through the main shaft and arms. The hollow rim and "gravitating" part of the machine are to us entirely new.

Elliott's Gravitating Rotatory Engine.

A new and highly important discovery has recently been made in the application of steam to a very simple machine, by combining those two powerful agents, *steam* and *gravity*, together, and called a *Gravitating Rotatory Steam Engine*, for generating a steady rotatory motion by the pressure of steam exerted between a gravitating weight and a *closed and alternating* valve,* and capable of communicating a direct rotatory motion, as a *first mover* to all kinds of machinery, *by means of a single wheel on a shaft*, requiring neither crank or piston, or but very few of the incumbrances of the common steam engines now in use.

The above is the invention of an Englishman, Mr. James Elliott, a native of Rothbury, Northumberland, Eng., a practical mechanic, who has been employed in the construction of a great variety of mills, and other machinery, in the Province of New-Brunswick, and has occupied the most of his leisure time for the last eleven years in its completion.† We have procured a drawing of this gravitating rotatory steam engine, and from the following brief description, with which we have been furnished, we presume that any scientific person may form a pretty correct idea of its plan, simplicity, and capabilities. As to its application as a *first mover*, we may safely assert that it is unequalled.

The principal part of this gravitating rotatory steam engine consists of a strong cast iron wheel, of any given diameter, having a hollow rim, with three, four, or more arms in it, some of which are also hollow, for conveying steam. A part of the space in the hollow rim of this wheel is very nicely fitted inside with a piece of solid cast iron, or other heavy metal, forming the *gravitating weight* intended to fix the maximum of the desired power, which weight slides *freely* all round this rim, *or more properly the rim round it*, and is made steam tight at or near its ends, either with packing in the common way, or with mercury. The steam is made to enter the wheel at its centre, by a moving steam-tight collar, fitted on the wheel shaft close to the wheel, and passes by a valve into one of the hollow or *working* arms, which conducts the steam to the rim while that arm is at the lower circumference,* when the valve at the extremity of the arm shuts, and brings the pressure of the steam in contact with the gravitating weight in the hollow rim, where, acting with its expansive force against the end of the weight, and pressing against the closed valve, a separation of these parts takes place, the rotatory motion is generated, and the wheel is moved round by this joint resistance (the weight remaining suspended at the pressure) until that arm is carried round to the top, when the valve attached to it opens and lets the weight slide quite clear of it; *whilst the valve in the opposite arm* being at the bottom in *its* turn, now shuts through and cuts off a small body of the steam at its pressure, and resists the flowing steam as the first one had done before, at the same instant opening the exit valve immediately behind it; the valves attached to the working arms thus alternating with great mechanical regularity, let the speed be ever so great, being instantly and simultaneously *shut* when at the bottom, and *open* when at the top of the circumference.

A rotatory engine of 100 horse power, of this descriptive principle, would not weigh more than 1¾ or 2 tons—need not be over 10 feet diameter—or the hollow rim not more than from 10 to 18 inches wide; for although the longest leverage is at all times the most desirable, yet the difficulty of construction is somewhat increased by so doing. For steamboats, this rotatory engine is put immediately on to the paddle-shaft which crosses the

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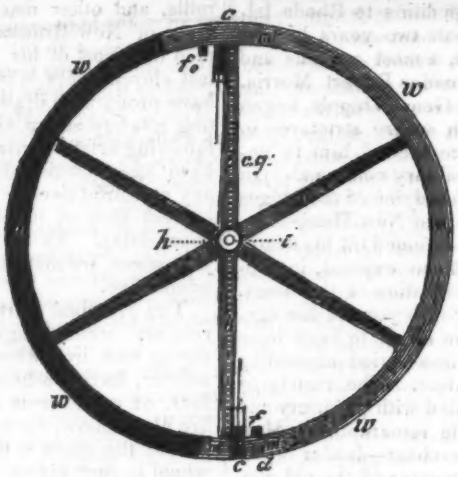
* Resembling in operation a dog in a turn-spit; but as the weight will not move like the dog, the steam is introduced between the weight and valve, to represent the dog's motion; or resembling a sailor setting *an-end* a bale or barrel: he places his back against something solid, and setting his feet against the bale, pushes it into its place. In this operation, the steam introduced as before represents the man's motion.

† The model of the first attempt having been destroyed in the great fire at Miramichi, in the year 1825.

* Each working arm is fitted with sliding valves worked by hand gearing, for starting the machinery, or reversing the motion.



boat, occupying the centre of the boat; or two smaller wheels may be used, placing them near to the sides of the vessel, and on each side of the boiler, which boiler may be in the middle.

As stated before, the motion produced is one continued, steady rotation; there is no waste of steam in the operation, and not an atom of steam goes into the wheel but what *must* exert its whole force—is subject to no unequal pressure, no retardation or jerking (inseparable from the use of cranks)—no minor parts of machinery to get out of order—no friction except the shaft in its boxes, the steam collar, and the sliding of the gravitating weight through the rim; its advantages also in *time saved* are as much superior to engines on the *old principle*, as a *wheel* lathe is to a *pole* one. The cost of construction will not exceed one fourth the price of an engine on the old principle, nor occupy more than one fifth of the usual space—can be worked on either the high or low pressure principle; when for the latter, he adds a small wheel of the same description, on the same shaft, and not over 4 feet diameter, or 3 inches square in the rim, for an air pump; and makes double steam pipes in the working arms of the large rotatory wheel.

It must be highly gratifying to the lovers of science in general, that this highly important discovery of a new application of steam has been made, and to learn that this engine, which has occupied the attention of scientific gentlemen and practical mechanics, both in Europe and America, from the early days of the highly gifted Watt to the present time, should at length have been discovered amidst the forests of New-Brunswick, by an unassuming mechanic, among other pursuits occupying his winter evenings' amusement.

Labor omnia vincit.

References—*w*, *w*, *w*, *w*, exhibits a ull view of the engine wheel, exposed with one of the sides off, on a scale of a quarter of an inch to a foot; *a*, the gravitating weight, occupying so much of the hollow rim; *b*, *b*, the working arms; *c*, *c*, the valves attached to the arms; *c*, *d*, the lower valve, shut for resistance; *f*, the exit valve open, blowing off the waste steam, supposing the wheel to have already performed half a revolution; *b*, *c*, *g*, the upper arm with the valve open to pass the weight, and the exit valve, *f o*, closed—the dotted lines on the two working arms show the passage for the steam; *h*, the steam-tight collar on the shaft; *i*, the shaft—the motion, as the plan now lays, will be against the sun; *m*, *m*, *m*, *m*, the space occupied with steam when in motion. The wheel, as here represented, shows the position of the gravitating weight when working at a high pressure. When the steam gets at a lower pressure, the weight will gravitate and balance lower, and the valves open at a different part of the circumference; and as the opening and shutting of the valves depends on the position of the weight, and are governed by it, they never can come in contact with it, except as exactly wanted. The hand gearing is not represented on the plan, because there are several methods of fitting it; and on so small a scale it would be impossible to give a clear representation of any of them.

NEW ALKALOIDS.—The French chemists, who are exceedingly minute and successful in their researches, have discovered a mode of obtaining the salt of several narcotic vegetables, such as the deadly nightshade, apple of Peru, henbane, &c., to which they give significant names like the following:—*Sarsaparilline*, the active principle of sarsaparilla; *atrophine*, from Atropa bels ladonna; *hyoscyamine*, from Hyoschyamuniger; *daturine*, from Datura stramonium; and *solanine*, from Solanum nigrum. Physicians are those who will derive the most immediate advantage from these discoveries, as they are now ranked among the useful vegetable medicines.

DIVISIBILITY.—Five thousand equidistant lines have been traced in the space of a quarter of an inch, on a steel and glass surface, with the fine point of a diamond. Common writing-paper possesses the ordinary thickness of the five hundredth part of an inch, but gold-beater's skin, made by drying a membraneous part of the intestine of an ox, is six times thinner, when doubled.

[From the Journal of the Franklin Institute.]

American Patents issued in July, 1834.

3. For improvements in the *Crane used for raising and removing heavy bodies*; Hezekiah Bradford, city of New-York, July 8.

This crane is principally intended for raising and removing the earth, or other bodies, in excavating the ground for canals and railroads, and it is so constructed, that the boom which sustains the load can be made to raise it to a considerable height, and deposit it upon a bank in any spot required. The boom is rigged to a mast, and the respective motions are produced through the intervention of tackle. The arrangements have been made with much skill, and so far as a judgment can be formed from the evidence before us, we see no reason why the apparatus should not operate in a very advantageous manner. The whole description has reference to the drawings which accompany it, and these, indeed, seem absolutely necessary to the understanding of its details.

It is stated that, "by the use of the above machine, a horse, or other animal, and one driver, will accomplish the removal and deposit of a greater quantity of coals, or other heavy bodies, from one spot to another, or to and from a wharf, barge, scow, or other vessel; or remove and deposit in the same manner, from excavations, or in other similar work, a large quantity of earth, or other heavy materials."

"By the arrangements for altering the rake of the mast, I with facility cause the weight that is raised to swing round whilst in the act of raising, and to be carried to the place where it is to be deposited, governing the motion thereof so as to make it more or less rapid, by merely changing the rake of the mast, and the position of the snatch block, so that it shall be further from, or nearer to, the mast. I cause the emptying of the load, or the *dumping*, as it is called by the workmen, to be effected by the same power which raised it, and at the moment at which it arrives at its place of destination."

"I do not claim as my invention, or improvement, the introduction of the use of a crane, or boom, for the purpose of raising and removing heavy bodies; nor do I claim as my invention, or improvement, any of the several parts of the above machine. But I claim as my invention and improvement, the combination in all its substantial parts, and the above described new arrangement and adjustment of the parts of said machine to each other, in such a manner as to produce the above results, when applied to the purposes above specified."

8. For a *Horizontal Straw and Vegetable Cutter*; Paul Moody, city of Philadelphia, July 8.

The straw, or vegetables, to be cut, are placed in a box, or hopper, in which they descend by their own gravity, so as to come into contact with a revolving blade, extending from the centre to the periphery of a horizontal wheel. The patentee says, "I am aware that simply a

wheel, with one or more knives, or cutters, screwed on the arms, in a machine for cutting straw, is no new thing. *But the peculiar* construction of the above described box-wheel in a machine for cutting straw, hay, &c. &c., which, with its regulating bottom, or gauge, the mode of fastening the knife and slitters to it, with the application of the latter in the machine to cut vegetables square, and also the apparatus above described for forcing down and compressing hay, straw, &c. &c., is what I claim as my invention and improvement."

Machines similar in principle have been previously patented and described by us; the claim, therefore, should be only for what are called improvements, the general construction belonging to the original inventor, and not being usable without his consent.

10. For a *Plough*; James Jacobs, Maysville, Mason county, Kentucky, July 8.

11. For a *Plough*; James Jacobs, Maysville, Mason county, Ken., July 8. [Denominated the "Smeller Plough."]

21. For propelling machinery by *Horse Power*; Eliakim Briggs, Fort Covington, Franklin county, New-York, July 12.

This is the common, inclined, movable floor, upon which the horse is to walk. The cross slats are to be connected together by staples and links on their under sides, which, by their bearing against each other, as the floor becomes straight, are to sustain it, with the horse, or horses, upon it. The doing this by means of the staples and links, is the part claimed as an improvement. There are at least two existing patents for sustaining such a floor, without ways between the drums at the ends; in both these instances, however, blocks, or stops, attached to, and rising to some height above, the upper sides of the slats, were to be brought into contact by the straightening of the floor. This latter method is undoubtedly preferable to that designated in the foregoing patent, but neither of them can be safely depended upon, with the weight of a horse upon the floor, as it is subjected to a leverage which will, sooner or later, cause them to fail.

25. For an improved *Cider Mill*; Nathan Booth, Cheshire, New-Haven county, Connecticut, July 12.

This cider mill is to be made in the form of the old-fashioned coffee or bark mill, with a conical nut, and a shell adapted to it, both of which are to be made of wood, the grooves or spirals upon them being formed by bars of iron fixed upon each, at an angle of about forty-five degrees. These bars are to be an inch wide, and half an inch thick; they are to project their whole thickness at the upper, or feeding end, but are to be let into the nut and shell, so that, at their lower ends, they shall not rise more than a sixtenth of an inch. The wood between them, at the upper ends, is to be grooved out, so as readily to admit the apples.

34. For a machine for *Cutting Laths*; Anna Hubbard, Wheeling, Ohio county, Virginia, July 18.

A plank, of about eight feet in length, is to be fixed so as to slide backward and forward, horizontally, in grooves made for that purpose, in a strong bench or frame. The plank is to receive its traversing motion of about eight inches, from a pitman, or shackle bar, attached to one end of it, which is acted upon by a crank on a fly-wheel shaft. A knife, the full length of a lath, and from four to six inches wide, is to be fixed upon the sliding plank obliquely, making an angle of about 20 degrees with the edge thereof. The stuff to be cut is first sawed into boards, and then cross-cut to the length of a lath; these boards are dropped edgewise into a groove falling so as to be cut by the knife, the board bearing against a cutting block, faced with steel on its under side. The laths pass, as they are cut, through an opening made in the plank for that purpose.

35. For a *Cheese Press*; Sylvester Kibbe, Schoharie, Schoharie county, New-York, July 18.

36. For a *Steam Fireplace*; John W. Cochran, Lowell, Middlesex county, Massachusetts, July 18.

The apparatus here patented is intended to heat dwelling houses, ships, and other places, by means of steam generated by a fire in a common open fireplace, or caboose, without interfering with the use of the fire for culinary or other purposes.

A boiler of metal is to be made in the form of the back and jams of an ordinary fireplace. The back part of this boiler is to fit against the back of the fireplace, and its ends against the jambs; it is not, however, we apprehend, to be in contact with them, but at a sufficient distance to allow heated air and flame to pass between them. The height of this boiler, judging from the drawing, will be about equal to that of the breast of the fireplace, and its depth at bottom about a foot, whence it is to slope back as it ascends; it is to have feet at the bottom, to raise it from the hearth. There are to be two long rectangular cavities in the front, something like ovens, into which the flame is designed to enter, to increase the heating effect, the double plates surrounding these cavities. Water is to be admitted through a pipe at top, and steam is to escape through another pipe, and to be thence conducted around a room, or wherever it may be wanted.

38. For an *Improvement in Wagons, or other Wheeled Carriages*; Reuben Rich, Albion, Oswego county, New-York, July 22.

The specification of this improvement is somewhat laconic, yet the writer terminates his description as though the few remarks made had been productive of some fatigue. The whole which can be called descriptive is in the following words: "The wheels are the same as common carriages, except the hubs, and the axles in the hubs. The axle in the hubs is a bar of iron through the hub, with the ends made round, sticking out of the hubs about two or three inches, as the case may be. These axles are made permanent in the hubs, and revolve round with the wheels, and the frame is explained in the drawing; so it needs no further explanation about it."

42. For a *Plough*; Henry Peachey, city of Philadelphia, July 25.

43. For a *Thrashing Machine*; Gideon Hotchkins, Windsor, Broome county, New-York, July 25.

Although a very labored description is given of this thrashing machine, and certain distinct claims are made, there still is not, in our apprehension, any thing presented which is new. The machine is of the cylinder and concave kind, with beaters which swing upon bolts passing through circular heads, in a way that is well known.

44. For improvements in the *Process of Tanning*; Edward S. and Daniel Bell, Smithfield, Jefferson county, Virginia, July 28.

45. For a *Female Auger for cutting Wagon Spoke Tenons*; John Lenher, Cocalico township, Lancaster county, Pennsylvania, July 28.

Bitts for cutting round tenons, or pins, have been long and well known, and have also been used for tenoning spokes for wheels. So far as we can judge from a very imperfect description, there is nothing new in the one which is the subject of this patent; if there is, it consists merely in a change of shape, without the production of any new effect, or the employment of any improved means.

A patent was obtained for an improvement in augers, or bits, of this kind, by Mr. Abel Conant, in June, 1829, as may be seen by turning to p. 176, vol. iv.; at which time it was not pretended that there was any thing new in the thing itself. The plan, as there proposed, we think decidedly superior to that now offered.

46. For a *Saw Knife*; Lorenzo Graham, Paris, Oneida county, New-York, July 29.

Take a common knife, and cut teeth in the back of it, and you have the patent *saw knife*, which, we are told, may be used for culinary purposes, for pruning, or for any thing else which may be found suitable.

American Patents issued in August, 1834.

1. For a Cooking Stove; Horace Bartlett, Carmel, Putnam county, New-York, August 1. The claim in this patent is to the "extending the bed of the fire so far back that it receives long wood, in such a way that only about one half of it is burning at the same time, unless the draft door is opened at the back, which may be done when more heat is required; thus putting in long wood, and leaving it perfectly under the control of the manager, consuming no more than what is required for immediate use, thereby saving the expense of cutting the wood into short pieces; thus acting somewhat like the principle of burning coal from the base, but applied to wood for a cooking stove."

2. For an Improvement in the Apparatus for Tanning; James R. Denniston,

Connersville, Fayette county, Indiana, August 1. In the petition, it is stated that the improved apparatus "consists of a vat protected from freezing in the bark house, in which is manufactured ooze of every desirable quality, from which it is strained off into a general reservoir, from whence it is dispersed, as required, throughout the yard, or raised to an elevated vat, and then dispersed, all by means of pipes, so placed under ground as to prevent freezing. The hides are hung perpendicularly in the vats of the yard. By means of this improvement there is a vast saving of labor and bark; at least twice the usual expedition; and excellence in tanning is secured, and no weather prevents the usual operations of the yard."

3. For a Washing Machine; Avery B. Gates, Connersville, Fayette county. Indiana, August 1.

4. For an Improvement in the Mode of constructing the Roofs of Buildings, and a Composition for covering all Kinds of Roofs, Brick or Stone Walls, Boards and Timber, exposed to the Weather; Daniel A. Balcom, Northampton, Bucks county, Pennsylvania, August 1. The compound resinous cement, here patented, is composed of eight parts tar, four parts rosin, and twelve or fourteen parts of finely pulverized dry clay, which are to be mixed together, and boiled until all the water has evaporated. Care must be taken that the ingredients be so proportioned, heated, and incorporated, that the mixture shall not be liable to melt and run by the action of solar heat, or to crack by its contraction from cold. The cement is to be laid on with a hot trowel, and all cracks and interstices must be carefully filled up. Among the purposes to which it is proposed to apply it, the coating of ships' bottoms, instead of copper sheathing, is mentioned.

5. For an Improvement in the Threshing Machine; John Marshall, Jr., Sweden, Monroe country, New-York, August 1. The so-called improvement is rather an appendage to the threshing machine, as it is intended to agitate and carry away the straw after it has been passed through the ordinary beaters. An endless apron is to be made by taking two long ropes to form its sides or edges, and from one to the other of these ropes, slats, or wires, are to extend, parallel to and within an inch or two of each other. This apron is to be stretched upon, and to pass over, rollers, and upon it the straw is to be delivered as it is threshed. It is to be of such length as to carry the straw out of the barn, and during its passage a beater is to strike upon it to agitate the straw, and shake out the last portions of the grain. It is to be moved by the same power which gives motion to the threshing machine.

6. For a Truss for the Cure of Hernia; Thomas Lawrence, Clarke county, Kentucky, August 4. A pad is to be made of wood, which may be round, and from two to five inches in diameter. The side intended to be worn next the body is to be convex, and the opposite side flat; this pad, or block, is to be perforated through its centre, to admit a wooden pin to slide in it, which pin has a head of such size as shall pass into, and bear upon, the ruptured cavity.

7. For a New Manufacture of Figured Fabrics; John Smith, Shaeffers-town, Lebanon county, Pennsylvania, August 4.

"To all whom it may concern, be it known, that I, John Smith, of Shaefferstown, Lebanon county, in the State of Pennsylvania, have invented a new manufacture of woven figured stuffs, such as carpeting, coverlids, table covers, and various other articles, either in single or mixed colors; and I do hereby declare that my said invention consists principally in the manner of preparing the chain to form the ground or basis of such fineness was such as to produce the intended effect, and a fine double yarn thus used I should consider as interfering with my invention, as it would enable the weaver to produce a manufactured article essentially similar to that described."

8. For a Blacksmith's Striker; Joel Woodel, Jackson, Madison county, Tennessee, August 6.

9. For a Cast-iron Sink; Zenos Tarbon. Franklin, Delaware county, and Levi B. Tarbon, Oneonta, Otsego county, New-York, August 6. The description of this affair is so very brief that it would seem impossible to say any thing about it in fewer words than those used by the patentees, which are: "The sink is thirty inches in length, and twenty inches in width, with a soap dish in one corner, and a hole through the bottom to let off the water; all of which is made of pot-metal, and cast whole."

10. For improvements in the Construction of Bee Hives, and the Management of Bees; Levi H. Parish, Brighton, Monroe county, New-York, August 6. In the construction of the hives here recommended, there is nothing very peculiar; but they are to be large, and to be divided into separate compartments, by means of smaller boxes fitted into them, which boxes may be removed and replaced at proper periods. The main thing insisted upon is the advantage of keeping the hives within doors, in the upper rooms of a dwelling, or other suitable building. The benefits resulting from this are fully set forth, with much earnestness and good sense.

11. For an improvement in Weavers' Harness; J. Blackmar, Killingly, Windham county, Connecticut, August 7.

12. For an improvement in the Art of Manufacturing Nails; Freeman Palmer, Buffalo, Erie county, New-York. Patent first issued October 25th, 1832; surrendered and re-issued upon an amended specification, August 7.

13. For an improvement in the Construction of the Saw Mill; Thomas Blanchard, city of New-York, August 8. "The principle of this invention consists of the combination of a circular saw with a common saw mill log carriage, of any convenient construction."

14. For an improvement in the Mode of Manufacturing Butt Hinges; Dorwin Ellis, Attleborough, Bristol county, Massachusetts, August 8. This patent is taken for the process by which the hinges are manufactured, there being confessedly nothing new in the machinery, which, in the present case, is merely adapted to the purpose to which it is applied. Strips of metal, about twelve inches long, and of a proper width, are to be cast with a projecting ridge along their whole length, which ridge forms the knuckle or joint of the hinge. The strips or plates, so cast, are to be passed between rollers, having grooves in them corresponding to the ridge in the strips; by this means they are equalized, and are then to be placed in a screw or other press, where they are cut off and the joints formed. The blanks or halves are next to be fixed in a drilling machine of the usual construction, after which they are ready for the pins.

15. For an improvement in the single twist Screw Auger; Nathaniel C. Stafford, Meriden, New-Haven county, Connecticut, August 8.

16. For an improvement in the spiral Screw Auger; Alfred Newton, Meriden, New-Haven county, Connecticut, August 8. This, instead of a two, is to be a three lipped auger.

17. For a Fire Engine; Thomas A. Chandler, Norfolk, St. Lawrence county, New-York, August 8.

18. For an improvement in Machinery for Dying and Printing; James Rennie, Lodi, Bergen county, New-Jersey, August 8. The specification informs us that the invention here claimed is "an improvement and combination of machinery for dying, stamping, or printing two or more different colors, mordents, or shades, at one impression, which improvement and combination I denominate the *magic sieve*." This is followed by a transcript of the whole of the specification of the patent obtained by the same gentleman on the 9th of June, 1834, and before noticed; and this is succeeded by a description of the magic sieve, which consists of an extension and variation of the same principle or combination that was the subject of the former patent.

(*To be continued.*)

Botanic Prizes. — About five years ago, the Society of Apothecaries, London, instituted two prizes, a gold and a silver medal, for the best written and oral examination in medical botany. The students, Edwin Edin and Arthur Tibbs, took the medals. This is a remarkable circumstance, and evidences either a want of industry or a want of research, or both, in those who have the reputation of being vastly wiser than they really are. [Scientific Tracts.]

New Mode of Making Spectacles. — Before the Eclectic Society, Mr. Samuel, an optician, exhibited a contrivance which was technically called a *slitting machine*, the use of which was to cut or slit out crystal lenses, for spectacles. It seemed to attract considera-

notice, and it is probably calculated to be of essential service in the arts, at least.—[Ib.]

LISBON AQUEDUCT.—The magnificent aqueduct that furnishes the city of Lisbon with water, and which has been cut off by the army of Don Miguel, may be regarded as one of the handsomest modern structures in Europe. From report, it will not yield in grandeur to any aqueduct left us by the ancients. That portion of it situated in the valley of Alcantara, about a mile from Lisbon, is of admirable structure, consisting of thirty-five arches at least, by which a stream of the purest water is carried across a deep valley formed by two mountains. The height of the middle arch, from the base to the summit, is 263 feet 10 inches; the breadth of the principal arch is 107 feet 8 inches. Each block of stone is in general 23 feet high. The arches on each side diminish in thickness, in conformity to the size of the stones, which, at the termination, are only 8 feet. They owe the execution of this magnificent monument to John V., who laid its foundation in 1713; nineteen years after which it was completed. The expense was covered by a tax of one real upon every pound of meat sold in the capital.—[Ib.]

AN AID TO LEARNING.—In the royal printing office of Paris, there are types of *fifty-six oriental alphabets*, comprehending all the known characters of the languages of Asia, ancient as well as modern; and sixteen alphabets of those of European nations, who do not employ the Roman letters. There are forty-six fonts of various forms and sizes. All the presses in the establishment are able to throw off 278,000 sheets a day, equal to 9,266 volumes 8vo, of 30 sheets each. The number of printers engaged in the office is three hundred and fifty.—[Ib.]

MECHANICAL POWERS.—From a late foreign periodical we have gleaned the following interesting items, by which it will be seen that steam is not the only, and perhaps not the most economical power, that may be used for mechanical purposes. Much yet remains to be discovered in the arena of nature.

New Moving Power.—At a meeting of the French Academy of Sciences, on the 16th of June, a very interesting communication was read from M. Thilorier, a skilful chemist, who exhibited to the Academy the apparatus by which he procured a litre (a quart) of liquid carbonic acid in a few seconds. The properties of this substance, he observed, have been but little examined, chiefly because it requires to be confined in close vessels, hermetically sealed, and capable of resisting a great pressure. It surpasses all known bodies in the expansion and contraction which it undergoes from given variations of temperature; from 32 to 86° Fahrenheit, a column of the liquified gas is elongated one half. With the same change of temperature a similar column of air is only elongated one-eighth. This enormous dilation, M. Thilorier thinks, will, in future, afford the elements of a moving power infinitely more effective, as well as economical, than that which is derived from the expansion of vapor.

New Mechanical Power.—An ingenious mechanic at Brussels has just applied a new power to mechanics, from which great results appear to be expected. This new power is galvanism. Across a fly-wheel, which is to give motion to the machine, he has placed a metallic bar, previously magnetised by a galvanic pile, and within the attraction of two very powerful magnets. The moment that the bar arrives in a rotary course at the limit of the attractive power, and when it would necessarily stand still, the inventor, by the application of galvanism, suddenly converts the attractive into a repulsive power, which continues the motion in the same direction, and by these alterations, well managed, the whole acquires a rapid rotation. The experiment is said to have been completely successful, and the machine worked a whole hour.

VISIT TO THE EGG-HATCHING OVENS OF CAIRO.—The hatching oven consists of a suite of small square chambers, or cells, arranged on either side of a small passage, in which they open; the doorway, when there are eggs within, being closed with mats. In some of the chambers the eggs had been newly put in, and were perfectly white; in others, having already undergone many changes, they exhibited a dirty yellow color; while, in several cells, the embryo having been warmed into life, had shattered its prison, and was emerging through the broken shell. Nothing is more common than the process of incubation, which, in fact, falls under the eye of every man; and the principle of the Egyptian hatching ovens, in which a heated atmosphere performs the office of the hen, is also generally understood; yet I could not behold without admiration a thick stratum of eggs, acted upon by an invisible fluid, bursting into spontaneous motion, rolling against each other, cracking, opening, and disclosing each an organized and animated being. As soon as the chickens are out of the shell, they are carefully removed into the passage, which is divided into numerous compartments by small ridges of clay; from whence, when a few days old, they are drafted off into cooler quarters. The passage, at the time of our visit, was filled with chickens; of which there must have been many thousands, not more than one day old, chirping, moving about, and nestling against each other.—Stones placed at intervals, like stepping stones in a brook, enabled us to traverse the several compartments. A number of low subterranean cells, in which an equal temperature is maintained by fires of dung, communicate a sufficient heat to the hatching rooms by apertures in the floor.—Few persons can endure, for any length of time, the intense heat of these ovens. We were glad to make our escape; and, on issuing forth into the streets, after making our saucy Arab a handsome present, we found the atmosphere of Cairo, at noon, cool and refreshing. Respecting this process, many erroneous ideas are prevalent in Europe. It has been supposed that the secret, as it is termed, is known only to the inhabitants of a few villages in the Delta, who, dispersing themselves over the country in autumn, undertake the management of such eggs as are intrusted to their care; but there is no secret in the matter, and the eggs are thus hatched by the inhabitants in all parts of Egypt. In the oven we examined there were at least twenty cells, each, perhaps, containing five thousand eggs; so that, should they all take, one hundred thousand chickens would be produced in twenty-one days; or one million seven hundred thousand per annum, supposing the process to go on without intermission. Two hundred similar ovens, kept in constant operation, would therefore, hatch, in the year, three hundred and forty millions of chickens! so that were this practice introduced into England, it would very speedily redues the price of poultry.—[St. John's Egypt.]

[From the New-York American.]

COUSIN'S REPORT ON EDUCATION IN PRUSSIA, as translated by Mrs. Austin, and republished in this city by *Wiley & Long*, is a book of so much value, that we gladly make room for the annexed paper—founded on its recommendation of normal schools—by *J. Orville Taylor*. We wish we could induce all who either have children to educate, or any connection with schools, to read *Cousin*. Yet, strange to say, while a novel, frequently more likely to corrupt, than to improve, the mind, is eagerly sought, this admirable book has found few or no purchasers in this city.

SEMINARIES FOR TEACHERS.

By J. Orville Taylor.

Mrs. Austin, the accomplished translator of M. Cousin's Report on "Public Instruction in Prussia," says "there are two or three other points which I would fain recommend to the peculiar attention of the reader. One of the most important, is the absolute necessity of securing a constant supply of well-trained schoolmasters. Time and experience have, it is to be supposed, nearly removed the illusion of "mutual instruction" as a substitute for the instruction communicated by a mature to an immature mind:—as an auxiliary in certain mechanical details, no one disputes its utility. Observation long ago convinced me of the entire truth of the maxim laid down by the Prussian government, and approved by M. Cousin, that, "As is the master, so is the school." There is no truth more evident than the one expressed in this maxim. The schools must from the necessity of the case be like their teachers, hence the absolute necessity of using proper means to qualify them for the profession of teaching. In this department of instruction, Prussia is far in advance of the United States. That despotic government (though at present paternal in administration) requires the teachers of elementary schools to pass through certain stages of preparation in a normal school, before they can assume the difficult and responsible station of Instructor. The organized school system in neither of our State governments, makes no such requirements. We have not till very lately given any encouragement to young men that would induce them to make suitable preparations to teach even a district school. The State of New York has just made some provision for the education of teachers; the plan we shall speak of before we close this article. There have been a few private seminaries which have made the education of teachers their principal object; but these have received no assistance from government, and have done very little towards supplying the schools of the United States. The Seminary at Andover, conducted for several years past by the Rev. *S. R. Hall*, has done much good, both as presenting a model for such institutions, and by sending out many able instructors. At present it seems to be generally admitted that such institutions are indispensible, and that it is the duty of the State governments to establish and sustain them.—Since we are about to open seminaries for teachers among us, it is fortunate that we have a full and faithful report by M. Cousin, of the workings of the Teachers' Seminaries in Prussia. The American edition of this work will furnish our Legislature, School Committees, and School Teachers, with instruction, not only from the highest authority, but also from the most enlightened source. While speaking of the necessity, nature, studies and benefits of seminaries for teachers, I shall avail myself of such parts of this report as will give light and interest to the subject, for says M. Cousin: "The true greatness of a people does not consist in borrowing nothing from others, but in borrowing from all whatever is good, *and in perfecting whatever it appropriates.*"

In *M. Cousin's*, remarks on the training of primary instructors he says, "the best plans of in-

struction cannot be executed except by the instrumentality of good teachers; and the State has done nothing for popular education, if it does not watch that those who devote themselves to teaching be well prepared; then suitably placed, encouraged and guided in the duty of continued self-improvement; and lastly, promoted and rewarded, in proportion to their advancement, and punished according to their faults. Such is the object of title 6, of the law 1829. We translate that, as we did those which preceded. A schoolmaster, to be worthy of his vocation, should be pious, discreet, and deeply impressed with the dignity and sacredness of his calling. He should be thoroughly acquainted with the duties peculiar to the grade of primary instruction in which he desires to be employed; he should possess the art of communicating knowledge, with that of moulding the minds of children; he should be unshaken in his loyalty to the State, conscientious in the duties of his office, friendly in his intercourse with the parents of his pupils, and with his fellow-citizens in general; finally, he should strive to inspire them with a lively interest in the school, and secure to it their favor and support.

"*Of the Training of Schoolmasters*".—In order gradually to provide schools with masters of this character, the care of their training must not be abandoned to chance; the foundation of primary normal schools must be continued. The expenses of these establishments should be defrayed partly by the general funds of the state and partly by the departmental funds for schools."

Here Cousin unequivocally declares that the "State has done nothing for popular education" if it does not see that the teachers are well qualified. The legislature of each state should immediately make provision for the education of common school teachers. That Prussia has done this, is the whole secret of her superior schools. But teachers must not only be "prepared," they must also be, and this by the government, "suitably placed, encouraged, guided and rewarded." How far short are we of Cousin's advice and Prussia's practice!!

The establishments for educating teachers in Prussia are supported by the government funds and by the smaller and local divisions of the government. With us the school fund of each state, may erect suitable buildings, remunerate the professors, furnish a library and apparatus, and bear a part of the students expenses while preparing himself for teaching. This would give encouragement, to make teaching a study and a profession for life.

The following extract is from Cousin's report, and is translated by himself from title 6 of the law of 1819. We make this extract to show the design which the Prussian government had in establishing teacher's seminaries, or to use the Prussian name "Normal Schools." "The principal aim of the primary normal schools should be, to form men, sound both in body and mind, and to imbue the pupils with the sentiment of religion, and with that zeal and love for the duties of a school master which is so closely allied to religion." It is seen that their design is to make their pupils *men*, in knowledge and in person, and not only this, but religious men, and men in love with their business. The next extract designates the length of time to be spent, and marks out the course of studies to be pursued in these seminaries.

"In each primary normal school the length of the course shall be three years, of which the first is devoted to supplemental primary instruction, the second to specific and more elevated studies, and, the third to practice and occasional experiments in the primary school annexed, and in other schools of the place. When the supplemental instruction is not required, the course may be reduced to two years."

The plan proposed for this State in the report of, and adopted by, the regents of the University, is to select one academy in each of the eight Senate districts of the State; to appropriate five hundred dollars to each, for the purchase of a library and apparatus adapted to the use of those who are preparing to be teachers, thus reserving six thousand dollars out of the permanent fund of ten thousand dollars now on hand, for future contingencies; and from the annual surplus revenue of the literature fund, (estimated at three thousand five hundred dollars,) to appropriate four hundred dollars to each of the Academies, to provide a special course of instruction in the art of teaching.

The following academies have been selected for this purpose.

For 1st Dist.,	Erasmus Hall Academy,	King's Co.,
" 2d "	Montgomery "	Orange Co.,
" 3d "	Kinderhook "	ColumbiaCo.,
" 4th "	St. Lawrence "	St.LawrenceCo.,
" 5th "	Fairfield "	Herkimer Co.,
" 6th "	Oxford "	Chenango Co.,
" 7th "	Canandaigua "	Ontario Co.,
" 8th "	Middlebury "	GeneseeCo.,

In regard to the course of study to be pursued, it is remarked in the report, that the *standard* should be raised "as high as possible," because "the qualifications of those who follow it will incline to range below, and not above, the prescribed standard:" It proposes that none should be allowed to enter on the course, who are not acquainted with reading, writing, arithmetic, grammar, and so much of geography as is found in the duodecimo works on this subject, usually studied in our schools. The following are the subjects of study proposed for the teachers' course, which are required to be thoroughly taught, and while they are not intended to exclude others, shall not be allowed to give way to any.

1. The English language.
2. Writing and Drawing.
3. Arithmetic, mental and written; and Book-keeping.
4. Geography and general History, combined
5. The History of the United States.
6. Geometry, Trigonometry, Mensuration and Surveying.
7. Natural Philosophy and the Elements of Astronomy.
8. Chemistry and Mineralogy.
9. The Constitution of the United States, and the Constitution of the State of New York.
10. Select parts of the Revised Statutes, and the duties of Public Officers.
11. Moral and Intellectual Philosophy.
12. The Principles of Teaching.

Although the Regents have not excluded other studies than those contained in this programme, yet I am surprised that Botany, Zoology, and Agriculture, and even Physiology, are not included.

What more interesting and useful studies for our young farmers than Botany, Zoology, Agriculture? And how important is it that they should have teachers who are well acquainted with these departments of Natural History.—Composition likewise is not mentioned; one of the most important parts of every mans' education.

To secure the services of those who have been educated by the State, to make such follow the business of teaching as a profession for life is the most difficult thing of this part of Legislation. The graduates of Teacher's Seminaries will be qualified to demand a much higher compensation for their services, than the employers of district schools will feel disposed to give them: and unless there is something to prevent, the laborers will go where they are best rewarded. There are two ways of securing the services of those who have been educated in the teacher's seminary. The first is, by creating a disposition in parents to reward their teachers with an adequate compensation. If parents are disposed to pay these teachers as much, as they will be able to get at any other employment, they will secure them as teachers; but they will not teach unless parents pay more than they do at present. This rests with parents; and we do hope that they will adequately reward those who have spent much time and money in preparing themselves to teach.

The other way is adopted by Prussia. I think the feelings of the people and the spirit of our government would forbid this. I do not think that it can be adopted in this country. It may perhaps in part. The following extract from Cousin will show the laws regarding those who have been qualified to teach by the government. "Every pupil of a normal school is obliged, at the expiration of the term, to accept the mastership to which the provincial consistories may appoint him; the prospect of advancement being, however, always set before him as the consequence of continued good conduct." This compels every one who is competent to become a schoolmaster. If they are not competent, they are either rejected altogether or sent back to review their studies. This will be seen in another part of the same work referred to above.

"Every young man whose competency is admitted shall receive a certificate, delivered and signed by the whole commission, his examiners, by their president, and by the head master of the primary normal school or other establishment in which he was trained to his calling. It must state his moral character, and his degree of aptitude for teaching, such as prove incompetent shall, by a formal decree, be wholly rejected, or sent back to continue their studies."

The Prussian government is careful not to admit those into the normal schools who are physically or morrally disqualified from making good teachers. To show this we make another extract from Cousin.

"The normal school is by no means designed for those who are unfit for any business, and think, if they can read and write, they are capable of becoming schoolmasters. This notion is so deeply rooted, that you hear fathers declare with all the simplicity in the world—"My son is too delicate to learn a business,"or"I don't know what to make of my son, but I think of getting him into the normal school." We reply to such, that the pupils of the normal school must, on the contrary, be sound both in body and mind, and able to brave the toils and troubles of a career, as laborious, as it is honorable. Much neglect unfortunately, still exists, on a subject which is of the highest importance, the methodical preparation of these young men for the calling which it is desired they should embrace. A false direction is often given to their preliminary studies. A young man is believed to be well prepared for the normal school, if he have passed the limits of elementary instruction, and if he have acquired a greater mass of knowledge than other pupils. It frequently happens, that candidates who come strongly recommended from school, pass the examination without credit, or are even rejected. The most immediate and the most important aim of all instruction, is to train up and complete the Man; to awaken the energies of his soul, and to render him not only disposed, but able, to fulfil his duties. In this view alone can knowledge and talents profit a man; otherwise, instruction, working upon sterile memory and talents purely mechanical, can be of no high utility. In order that the teacher, and particularly the master of the primary school, may make his pupils virtuous and enlightened men, it is necessary he should be so himself. Thus, that the education of a normal school, essentially practical, may completely succeed, the young candidate must possess nobleness and purity of character in the highest possible degree, the love of the True and the Beautiful, an active and penetrating mind, the utmost precision and clearness in narration and style." The board of examiners connected with our seminaries may obtain some valuable hints from the preceeding extract.

Attached to every teacher's seminary should be a department for teaching the elementary branches of an english education. This is necessary that those who are preparing to teach may make a practical application of their instructions. On "Practical Teaching" hear Cousin. "All the studies and all the knowledge of our pupils would be fruitless, and the normal school would not fulfill the design of its institution, if the young teachers were to quit the establishment, without having already methodically applied what they had learned, and without knowing by experience what they have to do, and how to set about it. To obtain this result, it is not sufficient that the young men should see the course gone through under skillful masters, or that they should themselves occasionally give lessons to their shool-fellows; they must have taught the children in the annexed school for a long time, under the direction of the masters of the normal school. It is only by familiarizing themselves with the plan of instruction for each practical branch, and by teaching each for a certain time themselves, that they can acquire the habit of it without method."

MEANS OF INCREASING THE PRODUCTIVE POWERS OF SOILS.—The means at our command of increasing the productive powers of soils may be comprehended under the general following heads:

1. Supplying to the soil those organic and earthy substances which may be required.

2. Altering its texture, depth and properties, by tillage and other means.

3. Changing its relation with respect to moisture.

4. Changing its relation with respect to temperature.

Vegetable and animal matters, in a decomposing state, appear to act in various ways, in increasing the productive powers of the soil. They improve its texture, and they may be supposed to increase its power to absorb and retain moisture: but above all, they supply that matter, which, in whatever form conveyed to the organs of plants, tends to nourish them. This matter being absorbed by the roots of plants, it must be supplied when exhausted.

Experience has in every age accordingly taught the husbandman to supply those substances to the soil; and the doing so forms one of the most important means at his command of maintaining or increasing its fertility.

Besides the animal and vegetable matter which is mixed or combined with the mineral part of the soil, and is essential to its productiveness, the mineral parts themselves, it has been seen, require to be mixed together in certain proportions, and in certain states of division, in order to produce the greatest degree of fertility.

Silica and alumina form the principal mineral part of the soil. If one or the other of these earths be in excess, the soil is defective in its composition. If the alumina prevails the soil is too adhesive; if the silica prevail, it is too loose. A medium is seen to be the best; and although the precise proportion in which the alumina and silica should exist have not been determined, it is safer that there be a tendency to an excess of alumina than silica.

Further, the fertility of the soil depends on the state of division, chemical or mechanical, of these minerals.

It would appear, then, to be a means of improving the composition of a soil, to add to its silicious matter when it is found to be too stiff, and aluminous matter when it is found to be too loose; and, further, to reduce the substances to their greatest degree of mechanical or chemical division.

Sometimes, accordingly, we have the means of improving the constitution of soils, by mixing sand with clay, or clay with sand. But, in practice, the direct mixture of these two substances, for the purpose of producing a soil of better texture, is rare; First, because the expense of this species of improvement is considerable; and, secondly, because in the state in which sand and clay are usually available for this purpose, it seldom happens that the aluminous matter of the one, or the silicious matter of the other, is in that state of minute division which is favorable to fertility.

It is otherwise with earth lime. This can, in all cases, be reduced by heat to that state of minute division which is favorable to the productiveness of soils; and hence can always be applied with benefit to those soils in which it is wanting.

Lime is sometimes mixed, in its natural state, with aluminous and silicious matter. It then forms a marl, a substance which is frequently applied to soils as a means of improving them; it is chiefly to the lighter soils that lime is applied; for then, is not only lime applied, but alumina, to improve the texture of the soil. It is by means of this mixture that some of the greatest improvements on silicious sands, that have taken place in Europe, have been effected.

There are cases in which even calcareous matter is in excess in soils. This occurs especially in districts where the chalk formation exists. When the earthy stratum resting upon chalk is very thin, the chalky matter becomes mixed with it, and being then in excess, forms a barren soil.

An obvious means of amending the composition of a soil of this kind, is by adding any of the other earths, whether silicious or aluminous. We need not here scruple to apply them, because the clay is coarse or the sand silicious. We may add them in almost any form in which they can be conveniently procured; for the effect will be to improve the composition of the soil.

There is another case in which, in like manner, silicious and aluminous matter may be applied directly in almost any state in which it may be found. This is in the case of peat. Here the vegetable matter is in excess, and the addition accordingly of any other earths is an amendment of the composition of the soil.

We see then, that the composition of soils may be improved by the addition of animal and vegetable matter, and also in many cases, by the addition of the earths in which they may be deficient, and in an especial degree of lime, which we can always apply in the form of minute division best suited to improve the composition of the soil. This is the first of the means referred to of adding to the productive power of soils, and will be considered in detail under the head manures, and other divisions of the management of the farm.

The *second* mean referred to of increasing the productive power of a soil, is altering their texture, depth and properties, by tillage and other means.

The mere effect of that communition of the parts of soil which it undergoes in the common operations of tillage, is seen to have a beneficial influence on the productive powers of the soil. Whether the soil imbibes from the atmosphere any thing but aqueous vapor or not, it is known that the exposure of the matter of the soil to the atmosphere, and the communiting of its parts by tillage, add permanently to its fertility. Thus we learn from experience the good effects of tilling lands well; soils once tilled are rendered for the most part more productive by the process. Peaty turf, if suffered to remain in its original state, may continue to produce nothing but heath and the most useless plants; but, if merely ploughed, and exposed to the influence of the atmosphere, it will at once tend to produce grasses of a better kind, and of greater variety; and again, if a subsoil of coarse clay be exposed to the atmosphere, for the first time, it is generally at the first very unproductive, and it is not until after long exposure to the air that it becomes productive. This is most remarkable in the case of clay marl, a substance in itself containing the materials of a fertile soil, but which is often barren, until after pulverization and the influence of the atmosphere.

It is, indeed, conformable to analogy, as well as to experience, that soils should be improved by pulverization and exposure to the atmosphere. In our examination of the constituent parts of soils, we have seen that their fertility is in a great degree indicated by the proportion of minutely divided earthy matter which they contain.

The effect of tillage, therefore, may be reasonably supposed to promote this division, both by the mechanical action of our instruments, and by exposing the particles of the earth to the action of the air.

Another object sometimes produced by tillage, and subservient to the amendment of the soil, is the deepening of the upper stratum.

The subsoil, it has been seen, is distinguished from the soil so called, by its containing less vegetable and animal matter, and so being less suited to the nourishment of plants; and in many cases it is even found to be injurious to vegetation. It is generally important, however, that there be a good depth of soil, and thus it is often expedient, as a means of effecting a permanent improvement of the surface, to plough up and mix with it a portion of subsoil, even though that subsoil should in itself be infertile.

These, then, are the principal mechanical means by which we can improve the soil, and they will be considered in detail, under the various heads which relate to the operations of tillage.

Another mean, indeed, of changing the composition of soils, is incineration, commonly called *paring and burning*. This process will be described as connected with the operations of tillage, and may be considered as one of the mechanical means possessed by us of adding to the productiveness of the soil.

The *third* mean referred to, of adding to the productive power of soils, is changing their relation with respect to moisture.

In warmer countries the soil is comparatively little injured by an excess of water, and more frequently suffers from the insufficiency of it. In climates like that of Britain, however, the operation of conveying away the water which is in excess is an essential one, and, if neglected, the best devised scheme of improvement may fail. The surplus water is either stagnant upon the surface, or penetrates below the surface. The freeing of cultivated land of water upon the surface, gives rise for the formation of land into ridges, by which the water escapes without stagnating upon the ground, or sinking into the subsoil below. This is an object necessarily connected with tillage, and will be described when the manner of cultivating land is treated of.

The freeing of the soil again from that superfluous water which is contained below the surface, forms a peculiar branch of agricultural improvement, and will be described under the head Draining.

As draining is more required in colder countries, so irrigation, or the watering of land, is less required than in those countries where the heat and evaporation are greater. Irrigation, however, is a curious and interesting branch of rural economy, derived by us from very ancient times. In this country it is chiefly employed in watering the lands in grass during the months of winter and spring.

The last of the means referred to of adding to the productive power of soils, is by changing the relation with respect to temperance.

This mean of adding to the productive power of soils, is less within our control than any of the others. It is only by slow degrees that we can improve the climate of a country. It is chiefly by draining, and the raising of hedges and wood: all of these, accordingly, form important objects of rural economy, and will be partially treated of in this work.

The means, then, of adding to the productive powers of the soil,—namely, supplying the organic and earthy substances which may be required—altering its texture,

depth, and properties, by mechanical means—and changing its relation with respect to moisture,—will all be treated of under the different divisions of our subject; and we shall begin with that which is most closely connected with the nature and property of soils, the nature and property of those substances which we apply to the soil under the name of manures.—[Cultivator.]

ITALIAN RYE GRASS.—The following communication relates to a grass of great promise, if it will withstand our winters. The French and Scotch commend it as highly as the Germans, though it is of but recent introduction among them; and our personal observation tallies with the high character which all give it. We sowed some in Sept. 1833. It promised remarkably well—but the winter killed it. We supplied some friends with seed, which was sown last season; it is of course not yet known what effect the winter has had upon it. The State Society have directed a quantity of seed to be provided for distribution, with the view of giving it a fair trial among us.

Description and Culture of the Italian Lolch.—(Translated from the German.)—The Italian Lolch, (Lolium perenne italium aristatum,) yields the most abundant fodder of any kind of grass that is known. Its extraordinary yield has, for several years past, extended the culture of it, in one part of Germany and Switzerland, very rapidly, and also in France some agriculturists have made experiments with it which were completely successful.

If sown in October,* its growth being very rapid, before winter sets in, it makes a thick sward equal to that on old grass land, and the first crop of hay is double to that of a common meadow. The Italian Lolch is entirely different from the English ray grass, which latter serves only as a means of making a sward on the land for pasturage, does not grow over 2½ feet in height, and gives but two ordinary crops in one season, while the former commonly grows to a height of 4 feet, on a soil more moist than dry, and gives always four abundant crops in one season, and frequently more.

The haulm is covered with leaves of a light green color. The most proper time to sow it, is in the fall. After a crop of grain is taken off from the land, turn the stubble over, harrow it and sow the seed. And frequently it grows large enough to cut before cold weather; but it is advisable not to cut it, because it will take better root if left. Such a meadow shows itself before winter thick and well overgrown, like an old one, and the first year's crop was, by haying time, a full one. Sowing it in the spring, or month of April, requires moist weather and more seed. The plant is lasting. And at the end of the seventh or eighth year, these meadows are as vigorous as they were in the first year. If, however, light places are to be seen, they may be renovated by letting the seed get ripe, and shell out, on such places, or they may be sown with new seed. A soil more moist than dry is generally best adapted for this plant, but it has been tried on high lands and on the Alps, where it likewise perfectly throve.

After grain or potatoes, (or other hoed crop,) a shallow tillage is sufficient. After clover or lucerne a deeper tillage is necessary, but on old meadow it is advantageous to cultivate first a crop of potatoes or grain, and after these being harvested in the fall, sow the Lolch. These meadows are treated like other meadows; every three years they receive a manuring—top dressing—and the first one is incorporated with the soil at the time of sowing the seed. The ground ought to be well harrowed. The seed is sown broad-cast—about 40 lbs. to the acre. If sown in the spring, 8 to 10 lbs. more are necessary, and one chooses as much as possible a wet time to sow it. After the seed is sown, harrowing may be dispensed with, but the ground ought to be rolled with a heavy roller. This operation has the double advantage to press the seed into the ground, and smooth the land for mowing.

H. D. GROVE.

Hoosick, Rens. co., N. Y., Jan. 31, 1835.

* Note by the translator.—The winter in those parts of Germany where the lolch is cultivated, does not set in so early as in this section of the country.

CIRCULATION IN ANIMALS AND PLANTS.—We extract the following useful enumeration of all the *microscopic* objects in the animal and vegetable kingdoms, in which a vital circulation has been hitherto observed, from a new work which Mr. Pritchard, the eminent cultivator of this branch of science, has in the press, entitled, "List of Microscopic Objects:"

"The most interesting active phenomenon exhibited by the microscope is the circulation of the nutritious fluids in animals and plants. In the former, the globules of blood may be seen passing rapidly along the capillary ends of the arteries into those of the veins, when the intervening membrane is sufficiently diaphonous, as in the ear of the young mouse, the fins and tail of the carp, gold fish, stickleback, tadpole, and of most small fish, and in the web between the toes of the frog, lizard, eft, &c. For these purposes, a magnifying power from 100 to 250 times linear is sufficient.

"In the arachnoida, (spider tribe,) at the joints of the legs, I have observed the circulation very distinct, the current of dark globules passing rapidly at each pulsation of the dorsal vessel. In the antennæ and wings of terrestrial insects, it has also been seen when they have just emerged from the chrysallis, as in the peria viridis and semblis billineata. In several aquatic larvæ and small crustacea, the circulating fluid traverses the limbs, antennæ, and tail, and thence moves along the dorsal vessel towards the head, and down the sides of the body in cavities, and not distinct vessels, hence called *diffused* circulation. The most favorable subjects for viewing this are the following, the first six of which are drawn and described in the *Microscopic Illustrations and Cabinet:* Larva of the ephemera, (the recent discovery of the beautiful mechanism of the dorsal vessel of this larva, by Mr. Bowerbank, is fully confirmed by the careful dissections of Mr. Newport, who with much perseverance has extended these inquiries to the other states of insects—see *Roget's Physiology;*) larva of hydrophilus, small disticus, agrion puella (in this elegant larva I have not observed the circulation in the legs extend beyond the haunches); libellula, round lynceus, fresh-water shrimp, water hog (oniscus); ligia, water flea (daphnia pulex), &c. Power from 100 to 250 times linear.

"In several of the polypiferous zoophytes, as the tubularia indivisa, sertulariæ, campanulariæ, plumulariæ, &c., Mr. Lister has by means of the achromatic engiscope, discovered a circulation to exist, which in many respects resembles that in plants.—See *Phil. Trans.*

"The circulation in plants, termed *cyclosis*, is a revolution of the fluid contained in each cellule, and is distinct from those surrounding it. It can be observed in all plants in which the circulating fluid contains particles of a different refractive power or intensity, and the cellules of sufficient size and transparency. Hence, all lactescent plants, or those having a milky juice, with the other conditions, exhibit this phenomenon. The following aquatic plants are generally transparent enough to show the circulation in every part of them: Nitelli hyalina, nitella translucent, chara vulgaris, and caulinia frigalis. In the frog-bit (hydrocharis) it is best seen in the stipulæ of the leaves and the ends of the roots. The magnifying powers suited for the above are between 100 and 250 times linear. In the spider-wort (tradescantia virginia) it is seen in the filaments surrounding the stamens of the flower: power 300 to 500 times linear. In the common groundsel (senecio vulgaris) it is said to be seen in the hairs surrounding the stalks and flowers."

Specification of a Patent granted to HENRY CRANE, *Merchant, and* JOHN YOUNG, *Patent Lock Manufacturer, for their invention of certain improvements in the making, manufacturing, or forming, of Iron Hoops for Casks, and other purposes.*—Sealed 20th March, 1834.

These improvements in making, manufacturing, or forming, of iron for hoops for casks, and other purposes, consist in giving to the narrow strips of hoop iron a curved figure; that is, bending the strips of iron from the usual straight form in which they are delivered by the ordinary operation of rolling, into such a curve suited to the diameter of the barrel round which the hoops are intended to bind, as will enable them, when formed, to lay close to the conical or elliptical surface of the barrel. This is effected by a peculiar method of acting upon the strips of iron by means of rollers, in order that such required lengths of iron, when cut off and bent round into the circular hoop shape, may be formed slightly tapering, or as the frustrums of cones.

The method by which this is effected, is by drawing out the bar or rod of iron by rolling, in the first instance, in a heated state, in the usual way, until it has been reduced to nearly the required thickness; we then set the rollers, so that their axles incline at a slight angle from the true parallelism, by which means the peripheries of the rollers will be nearer together at one end than at the other, and the strips of iron being then passed between these inclined rollers, will be necessarily compressed, or formed on one edge thicker than at the other edge—that is, of a wedge shape, if cut in a

transverse section. This may be done by relieving the screws which confine the axle at one end, and tightening them at the other end; or the same might be effected by making the grooves and ribs of the two rollers inclined to each other, instead of parallel.

When the strip of iron has assumed this wedge shape, in its transverse sectional figures, we then pass it, in its heated state, between a pair of parallel rollers, which, by pressing principally the thicker part of the substance of the strip of iron, causes that thick part to expand and elongate more than the thinner part of the strip, and, consequently, to extend or elongate the strip more on one edge than on the other.

This mode of operation will cause the strip of iron, as it is discharged from the parallel rollers in the last instance, to assume the form of a regular curve, and which curve may be varied to suit any required diameter and inclination of the surface of the cask, or barrel, by varying the inclination of the rollers, or the bevel of the groove, by which the strips are compressed into the wedge shape, that is, thicker on one edge than on the other; and in order to prevent the strip of iron from bending into irregular curves, as it passes in its heated state from the rollers, we have found it useful to place a curved guide, or conductor, near the rollers, which will enable the workman, as he draws out the strip of iron from the rollers, to preserve its desired figure with great accuracy.

Lastly, we wish it to be observed, that as the rolling of iron, for the purpose of bringing it into thin and narrow strips for the manufacture of hoops, is not new, of course that process is not to be considered as claimed by us; but the taking of strips of iron, previously made thicker on one edge than on the other, and passing them between parallel rollers, for the purpose of expanding the metal on one side of the strip more than on the other side, and thereby giving to the strip a curved figure as it is discharged from the rollers, being, to the best of our knowledge and belief, new, and never before employed by any other person, or persons, in the manufacturing of hoops, we claim that mode of operation as our invention, and forming the essential feature of our present patent right.—[Lond. Journ.]

Remarks relative to the Steam Engine.

To the Editor of the Railroad Journal:

Sir,—If you consider the following remarks relative to the steam engine worthy of attention, oblige me by giving them a place in your Journal.

In all machines it is a desideratum, that just such an amount of power should be applied as is necessary to produce the desired effect. When the effect to be produced requires different degrees of power at different times, the machine should be so arranged as to be able to exert more power at one time than at another; and it should at no time exert a power greater than is necessary to produce the effect required at that time. The want of thus apportioning the power and effect is obvious in many cases where steam is used, particularly so when it is used as the motive power on rail and other roads; and a great waste of power is the consequence.

In cases where locomotive steam engines are used on railroads, which are undulating, or various in their grades, it is common to give them such loads as they are capable of moving up the steepest ascents which they are expected to encounter between their places of starting and destination. If they are expected to pass ascents of 24 feet to the mile, they only take half the load which they are capable of moving on a level, and if they have to pass descents of that inclination, as well as ascents, they have nothing to do while they are thus descending. When stationary steam engines are used to draw boats or cars up inclined planes, they are generally idle during a considerable portion of their time, yet the steam must be kept at its full pressure, so as to be ready for any work which may offer.

In order to prevent this waste of steam when used as the *primary power*, it is proposed to employ the engine during its moments of ease and leisure, in condensing atmospheric air, which condensed air will be used as a *secondary* or *reserved power*, and be applied to assisting the engine when it has the most to do.

The atmospheric air to be condensed in air chambers of *globular*, *cylindrical*, *oval*, *rectangular*, or other shape, as may be found best suited to the case, and to be made of copper, iron, or other suitable material.

The air to be passed from the air chamber, through *hot tubes*, to one or more working pistons, similar to the pistons of a high pressure steam engine; the tubes to be kept at as high a temperature as is found expedient, so that the air may enter the cylinder of the working piston rarified as much as possible, whilst the air in the chambers will be kept at a low temperature by surrounding them with a non-conductor of heat. Although the use of the hot tubes will greatly tend to economise the use of air, it may not be found expedient to use them in all cases.

In cases where *globular air chambers* are used, they may be provided with *air measures*, so that, although the air in the chamber may have a pressure greatly exceeding that necessary for producing the desired effect on the working piston, yet such a quantity only shall be let out at one time as is necessary to produce that effect. This may be done by having something like a safety-valve to the measure, so adjusted as to shut off the supply of air from the chamber at the moment it raises.

In cases where the air chambers have a shape other than globular, they may be provided with a *piston* so arranged as to decrease the size of the chamber as the air is used; that is, for each cubic foot of air used by the working piston, the air chamber shall be reduced in size one cubic foot, by which means the full pressure of air will be kept up, until it is all exhausted. These pistons may have a vertical or a horizontal motion, and may be forced into the chamber by *levers and weights*, *cords passing round drums*, or *cog wheels working in racks*.

After the air has produced the desired effect on the working piston, it is proposed to pass it into the fire of the engine, so as to hasten the combustion of its fuel.

When locomotive engines have not weight enough to produce the necessary adhesion, it is proposed to connect the wheels of the engine with those of its tender, and, if necessary, with those of several of the loaded cars following next after it. The forward and after wheels of the engine and cars may be connected by *cranks* and *connection rods*; and the wheels of one car with those of another, by *chains*, with suitable *links*, passing round *cog wheels* fixed on the middle of the axles. The chains may be made to work tight on the cog wheels by *pressure wheels*, to be so arranged as to cause the two sides of the chain, that is, the sides of the chain above and below the cog-wheel, to approach each other, and to operate only when necessary.

An engine having the two kinds of power thus combined, it will be proper to entitle the *Pneumatic Steam Engine*, and the advantages which must result from the combination are obvious.

The capacity of the ordinary locomotive steam engine used on railroads, must be greatly increased by it; in some cases it may be doubled. Even when it is used on level roads, it is often difficult to keep up the pressure of steam. By having condensed air on hand, the deficiency of power on account of the low pressure of steam will not only be supplied, but the combustion of the fuel hastened, and consequently steam generated more rapidly, at the very time when it is most wanted.

By combining the secondary and primary power, in steam engines at the head of inclined planes, the steam engine need only have a power equal to the whole amount of work to be done, instead of a power equal to the elevation of the heaviest load, which may be offered at any one time.

The great difficulty in the way of using steam carriages on common roads,—viz., too much weight for their power,—will be measurably removed by the combination.

The combination may be used for the purposes of regulation and economy, in all cases where the steam engine is called on to exert a greater force at one time than at another, and where the intervals of time, during which the greater force has to be exerted, are too long for the advantageous use of the *fly-wheel*; and it may be used with advantage as a regulator of hydraulic as well as steam power.

In submitting the above remarks to the public, I am fully aware of the danger which surrounds me, in common with other inventors: that of being blinded by my partiality to the products of my own

mind. Perhaps I have already fallen into the snare; certain it is, that if there are any insurmountable difficulties in the way of making the combination, I cannot see them; but I wish to get at the truth, and therefore invite criticism.

Respectfully,

J. D. STEELE, Jr.

Ellicott's Mills, Md., Feb. 15, 1835.

[From the Journal of the Franklin Institute.]

Extract of a Report upon the Employment of Hot Air in smelting Iron with Charcoal. By M. E. GUEYMARD, Engineer-in-Chief of Mines.

A successful experiment in the smelting of iron by the aid of the hot air blast, has been made at the furnace of Riouperoux, (Depart. of Isere.) In this furnace, the distance from the blowing machine to the tuyere was insufficient for the erection of the apparatus for heating the air which the machine furnishes; they were obliged, therefore, to make the conduit pipe semicircular.

Six kilns, or ovens, were made with one chimney, 54½ feet, (French,) high, placed against the stack of the furnace. The fuel used in them was anthracite, which was applied to heat a pipe eight inches in diameter, and ten feet long; the part of the tube which traverses the fire was protected by a coating of fire clay, one inch thick, covered by a shield of cast iron, which received the direct action of the fire.

Five months' work have proved the efficacy of this arrangement; the expense of the construction of the apparatus for heating, including a tube for water, amounted to the sum of 5,009 francs, (1,001 dollars.)

Upon the blast pipe, and close to the tuyere of the furnace, is placed an air gauge, and a thermometer. The consumption of fuel by the air oven has been fixed at 150 kilog. (300 lbs.) of anthracite in twenty-four hours.

The experiments were commenced on the 3d of April; the fires were lighted in succession, and, on the 15th of May, five of them being lighted, the temperature of the air was raised to 125° R., (313° Fah.) and even as high as 130° R., (324° Fah.)

Before the introduction of hot air, the furnace was charged each time with 65 kilog. (130 lbs.) of soft charcoal, and with 77 litres (2¾ cubic feet) of ore.

Gradually the hot air was introduced, the temperature being raised more and more. They have been able to use with the same load of charcoal, quantities of ore increasing as 82, 87, 91, 102, and up to 105 litres; a quantity which has not been exceeded. It was observed that, at this maximum charge, the scoria, or slag, was more liquid, and the metal of a better quality, and finer than before.

The consumption of the five fires was 750 kilog. (1500 lbs.) of anthracite in twenty-four hours.

When they worked with cold air, the mouth of the tuyere was eighteen lines, (1½ inches,) in diameter, and the pressure of the air equalled twenty-four inches of water. Upon the introduction of the hot air, the diameter of the mouth was increased to twenty lines, (1⅔ inches,) and the pressure decreased to twenty inches. The number of charges were forty in twenty-four hours, in the first case; but in the second, they could not exceed thirty-four or thirty-five. Afterwards, having restored the pressure to twenty-four inches, they were enabled to increase the number of charges to forty.

The economy of fuel by the use of hot air, at the furnace of Riouperoux, may be estimated by the results of the castings made during the month of June, being about the average of three months' experiments, and about the same with those of the months of July and August.

During the month of June, 57,989 kil. of pig iron were made by the consumption of—Ore, 110,400 litres; charcoal, 1,104 charges.

To obtain the same quantity of metal by using the cold air blast, would have required 1,434 charges of the same charcoal. There was, therefore, a saving of 330 charges, of which the value, at 5 frs. per charge, = f. 1,650

Add 8 days' work of workmen, at 19.36 f., 154.88

1804.88 = $360.98

Deduct for the expense of heating the air,

Attendance of fireman, 45

21,500 kil. anthracite, 516

Interest, 10 per cent., on cost of the heating apparatus, 41.10

602.10 = 120.42

f. 1202.78 = $240.56

The benefit resulting from the employment of hot air was, for one month, 1202.78 francs, ($240.56,) or 2,072 f. ($4.14,) per 1000 kilog. (20 cwt.) of the casting produced. This is the minimum gain. Since, the general expenses are not given, and refractory mixtures of ores have frequently been used, during the month of June. It must be observed that the saving of 21,450 kilog. (42,900 lbs.) of charcoal, made in the casting, had required a consumption of 21,500 kilog. (43,000 lbs.) nearly an equal weight of anthracite, of which the value is much less than that of charcoal.

The tuyere was burnt through three or four times in twelve hours, an inconvenience which was remedied by surrounding it with water, after which the working of the furnace became perfectly regular.

The sixth fire having been lighted, the temperature of the air was maintained at 130° R. (324° Fah.), and was sometimes raised above; but no change was found in the working of the furnace, nor could the charge be increased beyond 105 litres (3¾ cubic feet) of mineral, to 65 kilog. (130 lbs.) of charcoal.

The dimensions of the tuyere mouth, and the pressure of the air, were varied, and the results were always inferior to those already stated; so that the maximum effect produced, with the mixture of ores employed, was, with a pressure of twenty-four inches of water, a diameter of tuyere of twenty lines, the temperature of the blast, 130° R. (324° Fahr.) and 105 litres of ore to 65 kilog. of charcoal.

A mixture of more refractory ores than the preceding, and which could not be smelted with the cold air blast, was reduced with much facility, but the charge of ore could not exceed 100 litres. It should be remarked, that the temperature of the blast, which appeared to give a maximum effect at temperatures not exceeding 130° R., was much below the temperature of melted lead, (604° Fah.) to which it had been carried in the experiment made at Vienna in a coke furnace.

Remarks on the foregoing, by the French Editor.

1. M. Gueymard has correctly observed, that unless the air can be heated by the flame which issues from the mouth of the charcoal furnace, those who are not able to procure a cheap combustible for the heating furnace, and continue to work with cold air, must be most unfavorably situated.

Happily, the attempts made in Germany, and the apparatus there contrived, and which has already been imitated in France, have shown that the flame which escapes from the furnace will heat to a proper temperature all the air which is required. It is recommended that at furnaces where charcoal is used, the heat which would otherwise be wasted shall thus be used, instead of the separate apparatus for heating air, thus augmenting the profits of smelting with heated air, by the whole value of the combustible consumed in the fires.

Thus at Riouperoux, the saving which has been made of 1202.10 fr. will be carried to 1763.78 fr. per month, or to 30 fr. per 1000 kilog. of iron produced, in place of 20 fr.

2. The best plan yet presented for heating the air by the flame at the top of the furnace is the following, which differs a little from that employed at Wasseralfingen, and described by M. Volz. The air required for the blast is passed through twenty small columns or vertical tubes, four feet long by two inches and a half in diameter, which are placed in a space or oven near the mouth.

By this means, the air is more heated, and there is less friction, than by passing it through a long tube horizontally, because the air passes slower, and has only four feet to traverse.

The diminution of the resistance to be overcome by the blowing machine is considerable and very important, because the water courses are frequently hardly sufficient, during the summer, to furnish the quantity of air necessary for the consumption of the iron furnaces.

3. The temperature of the air thrown into the furnace of Wasseralfingen, has been raised constantly to 165° R. (403° Fahr.) and often to 210° R. (504° Fahr.) with increased effect.

M. Gueymard, on the contrary, has observed that the production of iron was not augmented by an elevation of the temperature above 130° R. (324° Fahr.)

At Wasseralfingen, with the air heated

to a temperature varying from 165 to 210° R. (329 to 400° Fah.) to produce 1000 kilog. (2000 lbs.) of iron, 1130 kil. (2260 lbs.) of charcoal was consumed, in place of 1730 kilog. (3460 lbs.) burned when the cold air was used. The weekly production has been carried from 527 local quintals to 734 quintals—equal to 357 metrical quintals, (lbs.)

At Riouperoux, with the air heated to 130° R. (260° Fahr.) they have consumed for 1000 kilog. (2000 lbs.) of castings, 1270 kilog. (2540 lbs.) of soft charcoal, in place of 1610 kilog. (3220 lbs.) with cold air.

The differences between the results obtained in these furnaces are not considerable. It is remarked that in both the quantity of charcoal consumed in twenty-four hours is not augmented, but the charge of coal, and the daily produce of casting, has, by the employment of the hot air blast, received a considerable increase.—[Annales des Mines.]

[From the same.]

Report to the Board of Directors of Bridges, Public Roads, and Mines, upon the Use of Heated Air in the Iron Works of Scotland and England. By M. DUFRENOY, Engineer of Mines. Paris, 1834.

Some experiments by Mr. Neilson, Director of the Glasgow Cas Works, led him to think that advantage would be gained by previously heating the air to supply the smelting furnace. He communicated his ideas to Mr. Mackintosh, long known for his inventive genius, and they united in undertaking at the Clyde Iron Works, in concert with Mr. Wilson, one of the proprietors of the establishment, a series of experiments to determine this important question.

In the first experiment, the air from the blowing machine was passed through a rectangular trunk of sheet iron, ten feet long, four feet high, and three feet wide, where it was heated previous to its entrance into the furnace.

Notwithstanding the imperfection of this method, by which the temperature of the air could not be raised above 200° Fahr., it was evident from the experiment that the plan of Mr. Neilson was destined to produce a revolution in the manufacture of iron.

This first apparatus was soon destroyed by the action of the heat, and its renewal being very costly, they substituted a cast iron pipe, having in the middle an enlargement like the bulb of a thermometer.

This second apparatus produced beneficial effects; it lasted much longer, and the temperature of the air was raised by it to 280° Fahr. This increase, though small, produced a visible economy in fuel. Messrs. Neilson, Mackintosh, and Wilson, then understood the advantages which would result from raising the temperature many hundred degrees. They abandoned this heating tube, and constructed a new apparatus, presenting a great number of tubes, heated in many points of their length. By this means, the temperature of the air was raised to 612° Fahr., a temperature above that of melted lead.

Though this temperature was much below that required for smelting iron, (estimated at about 1500°) it produced a considerable saving in the consumption of fuel. Another advantage was obtained of great importance—that of being enabled to substitute crude coal for coke, without injury to the walling of the furnace. The quality of the iron was, on the contrary, improved, and the furnace, which produced but little more than half its quantity of No. 1 and half of No. 2, when fed with coke, gave a proportion much greater of No. 1 iron, after the substitution of crude coal. Besides, the consumption of fuel was considerably diminished. This last circumstance was owing, probably, to the fact, that the temperature of the furnace becoming higher, it was not necessary to add so great a quantity of flux to insure the vitrification of the gangue which accompanied the mineral. It is probably owing to this elevation of temperature that coal may be substituted for coke.

The better to judge of the progressive increase of economy obtained at the Clyde Works, in the experiments to be noticed, we give for each of them the different consumptions of coal and flux.

In 1829. The combustion being maintained by cold air—

		Tons.	cwt.	qrs.
Coal.	1. For fusion, three tons coke, corresponding to	6	13	0
	2. For the blast engine . . .	1	0	0
		7	13	0
Flux			10	2

In 1831. The furnace being in blast with air heated to 450° Fahr., they still burnt coke for the fusion of the metal—

		Tons.	cwt.	qrs.
Coal.	1. For fusion, 1 ton 18 cwt., corresponding to	4	6	0
	2. For the heating apparatus . .	0	5	0
	3. For the blast engine	0	7	0
		4	18	0
Flux			9	0

In 1833, July. The temperature of the air was raised to 612° Fahr., and crude coal used for fusion—

		Tons.	cwt.	qrs.
Coal.	1. For fusion . .	2	0	0
	2. For the heating apparatus . .	0	8	0
	3. For the blast engine	0	10	0
		2	18	0
Flux			7	0

At this last epoch, the employment of heated air had augmented the yield of the furnace more than one-third, and consequently had effected a great saving in labor. In fine, the quantity of air required to maintain combustion in the furnace was also found to be sensibly diminished. The blast engine of seventy horse power, which was sufficient in 1829 for only three furnaces, was found of ample power for the blast of four.

By comparing the results which will be indicated, it will be perceived that the economy in combustion is in proportion to the increase of temperature. As to the absolute saving, it varies in each furnace according to the nature of the coal, and the care used in carrying on the operation.

In spite of the complete success of these experiments, the introduction of heated air into the iron works encountered great difficulties. It was necessary to conquer not only the power of habit, but the prejudice generally existing, that the coal is sulphureous, and that its transformation into coke is not only favorable to combustion in the smelting furnace, but that it is indispensable to the making of iron of good quality.

This plan, in use four years in the environs of Glasgow, which it has saved from certain ruin, has scarcely passed the frontiers of Scotland. However, the wonderful advantages which it has produced, have began to triumph over these prejudices, and gradually to extend its use in the different provinces of England. I know of twenty-one works containing sixty-seven furnaces, which work with hot air. In Scotland, six; Flintshire, one; Derbyshire, three; Newcastle-on-Tyne, two; Newcastle-under-Line, two; Staffordshire, five; Pontepool, two. Total, twenty-one.

The iron made at these furnaces is generally No. 1, proper for casting the nicest work.

The plan is equally applicable to the metal intended for bar iron. To obtain this quality of metal it is only necessary to change the proportion of fuel and mineral. The forges upon the Tyne Iron Works, near Newcastle—of Codnor Park, near Derby—employ for the manufacture of bar iron, none but the pig metal produced in the hot air furnaces.

In most of the establishments cited, the crude coal has been substituted in place of coke. In some works, where this substitution has not yet been adopted, they assured me, as at Monkland Iron Works, near Glasgow, that the temperature of the air was not raised sufficiently to enable them to pass from the manufacture by coke. In some others, the quality of the coal being extremely bituminous, as near Newcastle, appeared to be an obstacle to the use of coal in the natural state.

The employment of hot air is not yet introduced into the great works at Merthyr Tidvil, Wales. The small consumption of coal which is employed crude, as I shall indicate at the close of this report, and the high price of the patent, has retarded its adoption; but I have no doubt that this plan will produce in this country a sensible saving in the consumption of fuel.

To appreciate the advantage which results from the employment of hot air, I shall give a statistical view of the works visited. I will describe the apparatus as far as they differ from each other; and I will compare the consumptions and expenses incident to the production of a ton of iron, before the introduction of hot air, and at present. This description will no

doubt appear tedious, but in so important a question, and one which may have immense influence upon our forges, I think nothing should be omitted tending to instruct our iron masters. I will then give some details upon the coals used in these works, and upon the expenses of manufacture in the Welsh works.

Finally, I will terminate the report by a recapitulation of the principal experiments which have been made in France to introduce the use of hot air in the iron works.

Before commencing this description, I should pay a just tribute of acknowledgment to the proprietors of the works which I have visited. Almost all have procured me, with a noble generosity, the means of studying their establishments with advantage. They have shown, in this circumstance, that the sole rivalry which exists between France and England is that of emulation.

Inquiry into the Penitentiary of Philadelphia.* (*October*, 1831.)

No. 28.—This prisoner knows how to read and write; has been convicted of murder; says his health, without being bad, is not so good as when he was free; denies strongly having committed the crime for which he was convicted; confesses to have been a drunkard, turbulent, and irreligious. But now, he adds, his mind is changed; he finds a kind of pleasure in solitude, and is only tormented by the desire of seeing once more his family, and of giving a moral and Christian education to his children—a thing which he never had thought of when free.

Ques. Do you believe you could live here without labor?

Ans. Labor seems to me absolutely necessary for existence; I believe I should die without it.

Ques. Do you often see the wardens?

Ans. About six times a day.

Ques. Is it a consolation to see them?

Ans. Yes sir; it is with joy I see their figures. This summer a cricket entered my yard; it looked to me like a companion. If a butterfly, or any other animal enters my cell, I never do it any harm.

No. 36.—The prisoner had suffered previously a punishment in the Walnut street prison; says he prefers imprisonment in the penitentiary, to the old prison. His health is excellent, and solitude does not seem to him insupportable. Asked whether he is obliged to work; he says no; but adds, labor must be regarded as a great benefit. Sunday seems interminably long, because then he is not allowed to work.

Ques. What is, in your opinion, the principal advantage of the new system, to which you are subject?

Ans. Here the prisoner does not know any of his companions, and is not known by them. It was a prison acquaintance, who, after I had left Walnut street, again involved me in a theft.

Ques. Have you sufficient to eat?

Ans. Yes sir.

Ques. Do you believe the yard belonging to your cell, is necessary for it?

Ans. I am convinced it would be impossible to do without it.

No. 41.—A young man; confesses to being a criminal; sheds tears during our whole conversation, particularly when he is reminded of his family. "Happily," says he, "nobody can see me here;" he hopes then to return into society, without being stamped with shame, and not to be rejected by it.

Ques. Do you find it difficult to endure solitude?

Ans. Ah! sir, it is the most horrid punishment that can be imagined!

Ques. Does your health suffer by it?

Ans. No: it is very good; but my soul is very sick.

Ques. Of what do you think most?

Ans. Of religion; religious ideas are my greatest consolation.

Ques. Do you see now and then a minister?

Ans. Yes, every Sunday.

Ques. Do you like to converse with him?

Ans. It is a great happiness to be allowed to talk to him. Last Sunday he was a whole hour with me; he promised to bring me to-morrow, news from my father and mother. I hope they are alive; for a whole year, I have not heard of them.

Ques. Do you think labor an alleviation of your situation?

Ans. It would be impossible to live here without labor. Sunday is a very long day, I assure you.

Ques. Do you believe your little yard might be dispensed with, without injury to your health?

Ans. Yes, by establishing in a cell a continued current of air.

Ques. What idea have you formed of the utility of the system to which you are subject?

Ans. If there is any system which can make men reflect and reform, it is this.

No. 56.—Has been convicted three times; has a feeble constitution; has not been well during the first months of his stay in the penitentiary, which he attributes to want of exercise, and sufficient current of air. He has been brought to the penitentiary at his own request; he loves, he says, solitude; he wishes to lose sight of his former companions, and form no new ones: shows his Bible, and assures us that he draws his greatest consolation from this book.

Ques. You work here without reluctance; you have said to me that this was not the case in the other prisons, in which you have been imprisoned; what is the cause of this difference?

Ans. Labor is here a pleasure; it would be a great aggravation of our evils, should we ever be deprived of it. I believe, however, that forced to do it, I might dispense with it.

No. 46.—Is fifty-two years old; was sentenced for burglary; enjoys good health; solitude seems to him a punishment extremely hard; the presence of the keepers even, is a great satisfaction for him, and he would consider it a happy event, if a minister would sometimes visit him; considers labor his greatest consolation. He denies having committed the crime which caused his conviction.

No. 61.—Was convicted for horse-stealing; says he is innocent. Nobody, he says, can imagine the horrid punishment of continued solitude. Asked how he passes his time; he says there are but two means—labor, and the Bible. The Bible is his greatest consolation. He seems to be strongly actuated by religious ideas; his conversation is animated; he cannot speak long without being agitated, and shedding tears. (We have made the same remark of all, whom we have seen so far.) He is a German by birth; lost his father early, and has been badly educated. Has been above a year in the prison. Health good. According to him, the adjacent yard is absolutely necessary for the health of the prisoner.

No. 83.—Thirty years of age; is in a state of relapse. In Baltimore, where he was detained, the discipline was very hard, and the daily task of labor very considerable.

Ques. Do you prefer being imprisoned here?

Ans. No; I should prefer to return to Baltimore, because there is no solitude there.

He has been but two months here; has had the fever; but his health is entirely restored.

No. 22.—A negro of thirty-four years; has been convicted for theft once before; eighteen months here; health pretty good.

Ques. Do you find the discipline to which you are subject, as severe as it is represented?

Ans. No; but that depends upon the disposition of the prisoner. If he takes solitary confinement bad, he falls into irritation and despair; if, on the contrary, he immediately sees the advantages which he can derive from it, it does not appear insupportable.

Ques. You have been imprisoned already in Walnut street?

Ans. Yes sir; and I cannot imagine a greater den of vice and crime. It requires but a few days, for a person not very guilty, to become a consummate criminal.

Ques. Do you think that the penitentiary is superior to the old prison?

Ans. That is as if you were to ask me, whether the sun was finer than the moon?

No. 68.—Age twenty-three; convicted of theft; has been here six months; health excellent; he is cold, and little communicative; he only becomes animated by speaking of the sufferings of solitude; he works with ardor; the presence of a visiter never interrupts his labor.

No. 85.—Has been here two months; convicted of theft. Health good, but his mind seems to be very agitated. If you speak of his wife and child, he weeps bit-

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* * Nobody is allowed to see the convicts, except the inspectors, the wardens, and the chaplain. [There are some few others, who are official visiters.—Trans.] The Philadelphia magistrates were kind enough to make an exception of the rule in favor of us. We were introduced into all the cells, and left alone with the prisoners. It is the result of a fortnight's observation, which we offer above to the reader. The number at the head of each article indicates the place which the prisoner holds in the list, as to the time of his imprisonment in the penitentiary. We have often omitted to note it down, as the reader will find.

* We believed it necessary to give literally the answers of the prisoners.

terly. In short the impression produced by the prison, seems very deep.

No. 52.—Age thirty-nine; is in a state of relapse; has been formerly in Walnut street; says that that prison is a shocking place; one cannot leave it honest. If I had been, he says, at first in this penitentiary, I should not have committed a second crime.

Ques. Have you accustomed yourself easily to solitude?

Ans. At first, solitude seemed to me horrid: gradually I accustomed myself to it; but I do not believe I could live here without labor. Without labor, there is no sleep.

This person has been nearly a year in this prison; enjoys good health.

No. 50.—Thirty-seven years old; in relapse; paints energetically the vices which prevail in Walnut street, where he has been imprisoned.

If they had put me here for my first crime, he said, I should never have committed a second; but one always leaves Walnut street worse than he enters it. Nowhere but here, is it possible to reflect.

Ques. But the discipline of this penitentiary is very severe?

Ans. Yes sir; particularly in the beginning. During the two first months, I was near falling into despair. But reading and labor have gradually comforted me.

This prisoner has been twenty months here. Health excellent.

No. 62.—A well educated man, thirty-two years old. He was a physician.

Solitary confinement seems to have made a profound impression upon this young man. He speaks of the first time of his imprisonment with horror; the remembrance makes him weep. During two months, he says, he was in despair; but time has alleviated his situation. At present, he is resigned to his fate, however austere it may be. He was allowed to do nothing; but idleness is so horrid, that nevertheless he always works. As he knew no mechanic art, he occupies himself with cutting leather for the shoemakers in the prison. His greatest grief is not to be allowed to communicate with his family. He ended the conversation by saying: Solitary confinement is very painful, but I nevertheless consider it as an institution eminently useful for society.

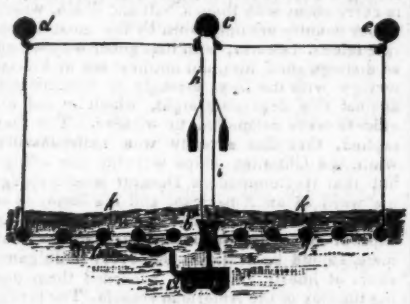
Health good. He does not complain of the physical part of the discipline to which he is subject.

The foregoing extract from the investigation of M. de Beaumont and M. de Toqueville, the French commissioners, will go far, we trust, to convince those who doubt the superior efficacy of *solitary confinement without labor*, of its lasting and useful effect on the great majority of the inmates of State-prisons. Although we would have every one to draw his own conclusion from the facts, we cannot omit to call attention to the remarks of No. 62, an educated and intelligent man, whose opinion is good evidence in the case.—[Ed.]

[From the Journal of Commerce.]

CATCHING SHAD BY STEAM.—When Solomon said, many hundred years ago, "There is nothing new under the sun," he could not have foreseen that a portion of mankind so universally known as the "Yankees" would be continually inventing something "new under the sun," and bring the elements so completely in subjection to their will and pleasure as to change the order as well as the "eternal fitness of things." Man has been told that he should live by the "sweat of his brow;" but the "Yankees" by their ingenuity appear to be seeking out a way, if not to counteract this injunction, at least to make it as easy and pleasant as possible. They have earned a name by their enterprize, their daring, and their ingenuity, which, although some envious minded individuals may affect to cast odium upon it, has given them a character of which these same individuals are proud, and which is blended with that of the nation so strongly as to leaven the whole.

Among all the inventions that have ever been patented, the one I am about to mention not only caps the climax, but certainly is the last any one would have thought of projecting and putting in operation—IT IS CATCHING SHAD BY STEAM.



In the absence of a *drawing* and technical terms, I will endeavor to explain it as well as I am able, though I presume a more accurate description will be given when it is in operation, which will be very soon, in North Carolina—where catching shad is a very extensive business, employing for three or four months a great many negroes, &c. at considerable expense, as their nets are a mile in length. A steam engine (*a*) of small power is placed near the water's edge, with a concave wheel (*b*) attached to the shaft. Abreas of the engine, and at a suitable distance from the shore (*k*) for dropping the nets into the water, is a buoy (*c*) anchored, with two blocks fastened to it; at a distance to the right and left of the centre buoy are two more (*d* and *e*) with one block each. On the right and left of the engine are five more (*f* and *g*), making ten, with blocks also. From the concave wheel, two ropes (*h i*) run parallel with each other to the centre buoy, through the blocks, one passing to the buoy on the right, the other to the buoy on the left, from thence to the shore, and running through the blocks there, to the concave wheel connected with the engine. It will be seen that when the engine is put in motion, the ropes are in motion also. Two boats, having the net equally divided between them, are fastened to the ropes running parallel with each other, and are carried out by them to the centre buoy, then to the right and left, and of course, as they separate, the net runs off from the boats into the water until they reach the other buoys. All that is necessary for the men in the boats to do next, is to take the ropes attached to the net for hauling it in to the shore, which is done by having the rope as it runs ashore take the boat with it in the same manner as they were carried out. When this is done, the rope running through the blocks on shore is cast from them, (being made so that it can be done,) and the ropes for hauling in the net take its place, and being attached to the engine, the shad are rapidly wending their way to the shore. The time occupied in taking out the net to the buoys, when placed in the boats and hauling it again to the shore, must be much less than it has been by physical strength heretofore. The plan certainly appears feasible; and if so, a great revolution will take place in this business. So great, that some other "Yankee" must *invent* some new method of separating the bones from the meat, so that it can be consumed as rapidly as the market is supplied; for I understand that the patentee calculates that the net will make its voyage in twenty minutes from the time it is put in motion on board the boats. So confident are those interested, (the patentee lives in this city,) that it will be fully tested next spring. K. N.

Hartford, Ct., Jan. 17, 1835.

[From the Weekly Review of the New-York American.]

THE AMERICAN MONTHLY MAGAZINE, New Series, No 1; edited by C. F. HOFFMAN and H. W. HERBERT: New York, D. K. MINOR, & T. & C. WOOD.—This is no new candidate for popular favor, but one that has given proofs of deserving it, and wears well, what it has fairly won. In one respect it does indeed present a new claim, and that is, its having passed into the possession of the author of "A Winter in the West," Mr. C. F. Hoffman. We feel assured that this is a claim which will be readily allowed, and that the talents and acquirements which he will bring to this Magazine, will add to the favor with which, while under the sole control of Mr. Herbert, it has been so deservedly received. Their united labors, aided by contributions from well practiced and well renowned pens—as we have reason to know they will be—cannot fail to establish the reputation and extend the circulation of this periodical. The number before us, has a large share of good papers; the first and the last alone, we apprehend are from the pens of the editors. In "the fortunes of the Maid of Arc," it is impossible not to recognize the glowing pen—the abounding incident—the impassioned style, and the admirable fidelity to historical *costume*, which made "Some Passages in the Life of Mary Queen of Scots," and other papers on analagous subjects, so eminently attractive and impressive.

In "The Ghost riders," the descriptive powers, the delight in Indian legends, and the vivid imagination, which give to "the Winter in the West" the interest of romance without departing from the soberness of truth, are again exhibited to advantage. It is a thrilling story.

But we find it impossible to speak at length of all the contents of the Magazine, tho' we will not deprive our readers of one, at least, of its tales. it is not long, and it is exceedingly well told.

An Incident at Algiers,

DURING THE VISIT OF DECATUR'S SQUADRON IN 1815.

The bay of Algiers is one of the most beautiful I have ever seen. The harbor is in a semi-circular form; at the further recess of which the city rises gently from the sea; and her white walls, flat roofs and terraces, from the narrowness of the streets, seem, from the seaside, joined together until they reach the surrounding hills—which are crowned with vineyards, and form altogether a striking and picturesque amphitheatre. On the western point of this harbor, a neck of land projects into the sea, and on its extremity is built one of the strongest castles for the protection of the place. It was from the guns of this castle, that in a few months after

the period of which I am speaking, the ship commanded by Admiral Milne, in the gallant attack of Lord Exmouth, suffered so severely. Close in with this fort our boats were obliged to pass on their way from our ships to the landing.

Delightful as was the appearance of all this to the eye, yet from our early recollections of blood and crime connected with the history of the place, we beheld it but as a "whitened sepulchre," and the intimation that we were soon to sail for the ulterior objects of our expedition, was received, I believe, with general satisfaction.

A constant intercourse had been established between the squadron and the shore from the moment when our difficulties with the Dey had been adjusted, and the treaty had been signed "word for word as it had been sent on shore." Crowds of officers were daily visiting the town, and among them the midshipmen of the different ships were always to be seen dispersed over the place, seeking with a perfect unconcern, even in sacred and forbidden ground, for objects to gratify their curiosity; receiving the courtesy of those Algerines with whom, when they were our prisoners, they had become acquainted, with as sincere a good-will as if they had never been enemies, or returning the haughty scowl of some stranger Turk with a smile of reckless indifference.

It was my good fortune, in addition to my ordinary visits on leave to the shore, to attend the commodore as one of his aids, in those which he made to the chief officers of the government; and I often had my feelings strongly excited by the humble looks and broken-hearted demeanor of the Christian slaves, by whom the lemonade and coffee were prepared and handed to us. Although habited in the loose petticoat-drawers, and slippers of the Turk, they were easily distinguished by their long plaited hair, the absence of moustache and beard, and above all by their dejected mein, from their lazy and overbearing masters. I had taken a deep interest in them, and had become familiar with many of their faces. Among them there was a young Italian of about five and twenty, the melancholy expression of whose handsome features had, upon my first seeing him, attracted my attention. There was something in his eye that spoke of proudet, happier days; and the quiet and almost indignant manner with which he calmly received his master's bidding, indicated that his spirit was not yet quelled within him, and was strongly contrasted with the readiness with which that bidding was obeyed when it administered to our pleasures.—It was evident that from some cause his feelings towards us were those of confidence and friendship. It might be that he looked upon us as connected with him by our common faith, or perhaps he felt grateful to us as the victors, who had humbled those who had enslaved him: and perhaps—and more truly as I afterwards thought—the hope of freedom was dawning on his spirit, and he regarded us as friends upon whom he might soon call for aid and protection. But whatever were his feelings, ours had been so strongly interested in his favor, that several of us juniors were at some pains to learn his story; and through the kindness of Mr. P., of Virginia—who had been detained since the capture of his vessel, a parolled prisoner at Algiers, until released by our squadron—we were enabled to gratify our curiosity. The tale of poor Angelo Salvini has often been told with darker additions, but I thought it gloomy enough, when I first heard it.

It was a beautiful night in the spring-time season, and the breeze, that floated along the coast of Calabria, though rife with a thousand sweets, was not more blithe in its gambols over tree and rock, and moon-tipped wave, than two young hearts which there swelled with rapture, as a bridal party danced upon the strand. An hour afterwards the scene was fearfully changed. There were marks of disorder in the adjacent thicket, as if a large body of men had rushed from them towards the shore, and there were traces upon the beach that could hardly be left by the light foot of a dancer—

> "Steps stamped and dashed into the sand,
> The print of many a struggling hand"—

and a silken scarf, or torn mantle, fluttered on the water's edge, or drifted before the rising wind, which now moaned around the headlands, as if unwilling to fill the lessening sail of the Corsair that was springing, with her prey, before it.

Poor Angelo! he knew not—and well he did not—what became of his bride. But like all exiles, who fondly think, that, can they but see their native land again, they may recover all that made it dear, his whole soul seemed bent upon seeing his Italian home once more, when somehow by the blessing of "our Lady," all would come right. He was never seen to smile, and there was that earnestness of expression in his face—that blending of manly resolution and winning gentleness, which had so struck and touched us at once—which, in a word, had interested all of us most deeply in his fate.

The incidents of that cruise were generally so novel and interesting, that the story of Angelo Salvini may have been forgotten by other officers, among themes of a gayer and more engaging character. But there are reasons why it can never be erased from my memory.

The arrival and vicinity of our squadron had caused an additional rigor in the treatment of the prisoners, and as a procaution against their escaping to any of our ships, they were compelled to carry about with them a ball and chain, which in our country are only worn by the most desperate felons. Decatur, with that generosity which so distinguished him, did not hesitate at his interview with the Dey, strongly to remonstrate against this degrading sight, which he and his officers were compelled to witness. The Dey replied, that this severity was indispensable, while the Christian ships were in the offing; but that if Commodore Decatur would pledge his word as an American, and his honor as an officer, that he would not countenance the escape of any of the captives, their rigorous treatment should be relaxed, and every indulgence short of liberty should be accorded them during the stay of the American vessels. The pledge was given for the captives' sake, and strict orders were issued throughout the squadron, that no prisoner was to be allowed to enter a boat, or under any circumstances to be brought off to the ships.

It was about noon, one day, when after landing a superior officer on the mole, from the second cutter, we had shoved off, and letting fall our oars, were soon under rapid way. We had proceeded the whole length of the basin, and were just doubling the castle which I have already described, giving it only berth enough to avoid the low rocks, that are piled for some short distance around its base, and behind which a person might easily be concealed. We were so near, as we passed, that the musquetoon of the Turkish sentinel was perfectly perceptible, as he paced up and down between the groups of cannoniers, who were eyeing us through the embrasures of two large pieces of ordnance, that nearly ranged with the point towards which I was pulling from the shore. My attention was directed to them, and the water was a little rough, which perhaps prevented me from seeing any object floating near the boat; and I was not a little surprised, when I saw the head of a man suddenly dart above the gunwale, holding with his teeth a knife, while his hands grasped eagerly at the blades of the oars, as the headway of the boat appeared to be carrying it past him, before he could make good his hold. His hands were on the quarter before my order had saved him from more than one blow with the looms of the oars. I seized the struggling swimmer by the shoulder, and with the aid of my stout coxswain, he was quickly placed beside me in the stern-sheets: but what was my horror upon discovering, while the man yet clung to the gunwale, that it was a Christian captive—that it was Angelo Salvini.—The instant commotion among the people collected on the mole, told me that it was impossible to screen him for a moment. To carry him off to the ship, in the teeth of the orders I had received, would have been madness. Yet, how could I deliver him up to the hellhounds that were even now opening upon their prey! There was a discordant cry from the infuriated crowd upon the mole, which, although unintelligible to me, yet its dreadful import to poor Angelo could not be mistaken; and in a moment the cannoniers hurried along the walls of the fortress, while a dozen calques shot from beneath its battlements. The eyes of my gallant crew, that but now melted with pity, flashed defiance, as they beheld this movement around the bristling cannon. But when they saw boats hurrying in pursuit, they curled their lips in scorn, and griping their oars, with a nerve that made them quiver in their rowlocks, they glanced at me so imploringly for the captive, and so triumphantly for themselves, that pity and pride almost obtained the mastery over duty, in my bosom. A single word from my lips, and the destruction threatened by the Infidels would not have prevented my noble fellows from sweeping beyond the reach of the Corsair boatmen. A single word, and, if we escaped the fire of the Moorish battery, which, from past experience no one dreaded, the hapless Angelo would have been at least in temporary safety beneath the Stars and Stripes. But I knew my commander too well to tamper with an order, that had been so imperious as that in relation to the captives. His honor as an officer, and his duty as a disciplinarian, would alike have insured the surrender of Angelo, and the punishment of myself; an aggravation of misery to the one, and the disgrace attending so gross a breach of orders to the other, would have been the certain consequences of my pursuing a different course of conduct from what I did. Yet, I shall ever remember it as one of the most painful moments of my life, when, as the barge of a Turkish officer hauled alongside of me, I determined to surrender the fugitive. I turned for a moment to look, before the act was done, at Angelo,—there was a resolved fixedness in the expression of his face, as he eyed the exulting look of those who claimed him, that revealed the determined purpose he had formed. Freedom had been almost within his grasp, and yet not a murmur, not an imploring word escaped his lips—they moved, but I thought it was in prayer to that cross, the bright symbol of his faith, and before which he felt the crescent had often paled.

But when I gave him up, and they were dragging him somewhat roughly into their boat, he turned and gave me one parting look, while his eye rapidly moved from my button to my face, as if he almost expected to see my countenance bear witness to what he deemed the tarnished badge of our service. That look, I never can forget, It was a mingled look of contemptuous scorn, and disappointed confidence. And yet, I could not, and I did not blame him. He knew not that *I*, as well as himself, was the victim of my orders. He knew not that the pledge, given by as chivalric a sailor as ever stepped a ship's deck, was given for the captives' comfort, and must be fulfilled for our honor: but that look, and the appealing murmurs of my men, almost shook my purpose; and, boy as I was, I so far forgot myself as almost involuntarily to seize my dirk, and to threaten, in my own language, as I leaned over the quarter, my impotent vengeance against the officer, in case he harmed the Italian. "The malignant and turban'd Turk" only answered with a scowl, as he turned round after gaining a boat's length from me.

The rapidity, with which the succession of incidents had occurred, prevented me from observing what had become of the knife, which, when I first saw the poor captive in the water, had attracted my attention, and I presumed that in lifting him on board, it had dropped into the sea.

My feelings had been wrought up to such a thrilling pitch of excitement, that ordering my men to drop the boat astern, in order to gain a more distinct view of the landing, we laid upon our oars watching his reception on the shore. A yell of delight told that they had touched the strand with their prisoner. There was an excited movement in the crowd—a rush and a struggle along the mole. My boat's crew sprung to their feet involuntarily,—and the tall bowman swore that he saw the knife of the Italian red with the blood of at least one Moslem, before a a dozen ataghans had cut him to pieces.

Poor Salvini! To avoid the horrible fate that he knew awaited him in being bastinadoed to death, he had stabbed the Turkish officer, and had fallen an immediate victim to the vengeance of his men.

O.

[From the Journal of the Franklin Institute.]

DETECTION OF ADULTERATIONS IN FLOUR.

M. Dubuc, senior, of Rouen, has applied himself with success to the detection of farinaceous mixtures in wheaten flour. The principal substances with which flour is adulterated are potato starch, a fecula; beans, barley, chalk, plaster of Paris, &c. An extract from his memoir is published in the last Bulletin of the Society of Encouragement, from which the following is taken.

There are two methods of detecting adulterated flour, mechanical and chemical. In France the adulteration is principally with potato starch, as it renders the bread whiter and heavier. If there be more than ten per cent. of potato starch, it may be detected by the naked eye, or with the aid of a magnifying glass; the fecula is whiter, the particles are angular, and reflect the rays of light, like minute crystals. To render the discovery more easy, M. Dubuc dries the suspected flour in a sand bath, at 100° to 110° of Fahrenheit; and then, with a good magnifying glass, so small an adulteration as five per cent. may easily be detected.

But if the miller has been cunning enough to grind the potato starch with the wheat, other means of detection must be had recourse to.

The first is, from the great difference between the specific gravity of wheat flour and potato starch.

The second is, that flour contains a certain per centage of *gluten*, and the starch does not contain an atom of gluten.

First Method.—A vessel that will contain one pound of flour, gently pressed down, will contain a pound and a half of *fecula;* from these data the relative portions of flour and fecula, in any parcel of flour, may be easily ascertained very near the truth.

Second Method.—The best flour contains about twenty per cent. of gluten, and, as we have stated, the starch not an atom.

Experiment.—Take five ounces of pure wheat flour, and two ounces and a half of warm water; mix and work it well for about ten minutes; the paste will be firm and elastic. Let a little warm water fall continually upon it, while you continue to knead it; by this means, all the starch and saccharine mucilage will be extracted. The operation is finished when the water flowing from it ceases to be white; what remains is gluten, the weight of which will be about one ounce. If the flour be adulterated, the paste will be more liquid, less cohesive, and less elastic, and an intelligent baker will soon be able to discover to what extent the flour has been adulterated, from the appearance of the paste, &c.

Such are the mechanical means that may be employed with success.

Employment of Chemical Agents to discover Frauds in Flour.—It will be well to bear in mind, that wheat flour is an animalized azotic matter, (*matiere animalise azotee,*) and that, on the contrary, fecula, or the starch extracted, pure from cereals, is entirely of a vegetable nature: from this difference results the varied effects of the re-agents employed.

The three chemical tests which have been found best for general use, are nitric and muriatic acid, and the liquid nitrate of mercury, (*deuto nitrate.*) Their chemical effects on flour and fecula are as follows:

1. Nitric acid has the property of coloring wheat flour of a fine orange yellow, whereas it neither affects the color of fecula nor starch.

2. Pure muriatic acid colors good wheat flour of a deep violet, but dissolves fecula and starch, and forms with it a light, colorless, viscous fluid, decomposable by alkalies.

Experiments with Nitric Acid of 40°.—Take 100 grains of pure wheat flour, pour on it 100 grains of nitric acid, (aqua fortis,) in a small earthen or China cup, stirring it with a glass tube, it will heat a little, and in a few hours it will change color from yellow to a fine orange color.

Take 100 grains of fecula, and pour on it 100 grains of nitric acid; heat it in every respect the same as above, but no caloric will be evolved, and the mixture will not change color.

Take of flour 80 grains, and of fecula 20 grains, and of acid 100 grains; mix well; the color will now be much paler, and of a light citron color. Take 50 grains of flour, and 50 grains of fecula, and 100 grains of acid; mix well; the color is now much paler than before, so that, with a little practice, the quantity of fecula may be detected by the greater or less intensity of colors.

Experiments with Muriatic Acid of 21 *Degrees of Strength.*—Take of wheat flour and acid, each 100 grains; mix well; the color will become at first red, then violet, and finish by becoming of a beautiful indigo color. This operation is accelerated if a gentle heat be applied.

Take 100 grains of fecula, and 100 grains of acid; the mixture is at first of the consistency of paste, and then becomes liquid; the fecula is dissolved, and the solution *colorless.*

On varying the proportions of flour and fecula, we shall soon be able to ascertain the quantity of fecula in a sample of suspected flour.

Experiment in the Liquid Nitrate of Mercury.—Take of flour and nitrate each 100 grains; mix well with a glass tube or rod. The paste will at first be of a pale citron, then reddish, and in three hours will become a full red. The color is permanent.

Take 100 grains each of fecula and nitrate; they will not combine, nor will the color of the fecula or starch be acted upon.

By mixing flour and fecula in different proportions, and observing the colors, we may soon be able to detect the proportions in which flour is adulterated by fecula or starch.

It may also be observed, that fecula absorbs less water than flour, which affords a ready means of detection.

The adulteration with bean or pea flour may be detected by pouring boiling water upon it, which developes the peculiar smell of these two substances.

We may add, that the adulteration with chalk, or gypsum, may be detected by pouring a diluted acid on the suspected flour, as an effervescence will take place, and carbonic acid gas be disengaged.

Experiments in Assaying.

To the Editor of the Mechanics' Magazine:

Sir,—I am engaged in the iron trade, and had an intention to erect a blast furnace a few years since for smelting iron from the ore of a new bed, and was naturally desirous, before doing so, to ascertain as nearly as possible what were its qualities. I therefore commenced assaying it and some other ores found in the neighborhood; but I soon concluded that the methods described in the books, which direct the use of "calcined borax, pounded bottle glass, chalk, &c." were not suited to the object which I had in view, namely, to ascertain what kind and quantity of iron might be expected from the ore when used in the large way in the blast furnace. I therefore laid those articles aside, and continued my experiments with the same materials which I expected to use when working the furnace; and the following memoranda show some of the results obtained.

December 2—Roasted 3 specimens of brown hematite ore:

No. 1 lost in weight 16.01 per cent.
2 do. 13.52 do.
3 do. 14.58 do.

	ozs.	dwts.	grs.	
Assayed	2	14	3	of the above ore with
		8	0	of limestone,
		8	0	of clay,
		10	0	of pounded charcoal.

The above, after being three hours in the furnace, produced 1 oz. 9 dwts. 9 grs. of metallic iron, equal to 54.27 per cent. The iron was tough, like the iron from a blooming fire.

Note—This experiment was not very satisfactory, on account of the iron not forming a good button at the bottom of the crucible.

No. 5. Assayed—

oz.	dwts.	grs.	
1	15	0	of roasted ore, with
	5	12	of clay limestone,
	5	12	of clay,
	7	0	of pounded charcoal,
	13	4	metallic iron.

The above produced, after 3 hours' heating, 1 oz. 13 dwts. of iron, which, after deducting the 13 dwts. of metallic iron added to the charge, left 19 dwts. 20 grs. for the produce of the ore, equal to 56.66 per cent. The slug was rather tough and infusible; the specific gravity of the iron, 7.238.

The foregoing, I dare say, is as much as you will desire at one time. Should yourself, or any of your readers, desire more, I shall be happy to furnish you with further extracts, and remain,

Your obedient servant,

J. D. W.

Vergennes, April 13, 1835.

[From the American Journal of Science and Arts.]

DIVISIBILITY OF MATTER.

Hanover, N. H., Dec. 18, 1834.

TO PROFESSOR SILLIMAN—

Dear Sir: There has been, as we well know, much labored discussion, and much waste of ink, upon the subject of the divisibility of matter. As the following has a bearing upon that point, and may be considered as a striking illustration of it, and as the result of my calculations was not a little surprising, as well as amusing to myself, and may be so to others, I send it to you, that you may, if you think fit, give it a place in your valuable Journal.

Several years since, as I was setting by my fireside, I observed several of my family around a table, reading by the light of a single candle. The thought occurred—how great a portion of the light of that candle is used by those several persons reading? And then immediately, a second thought—for how many persons does that candle furnish light sufficient to enable them to read, provided it could be so distributed that the whole should be used for that purpose without any loss? The candle was rather a large one, and gave a very clear, bright light. I found on trial, that I could read very well with my book at the distance of three feet from the candle, and with my eyes nine inches from the book. The candle then would illuminate the concave surface of a sphere of three feet radius sufficiently for the purpose of reading. By measuring, I found that the book I made use of contained on an average twenty letters to an inch, and ten lines to an inch. But as the spaces between the lines were broader than the lines themselves, instead of ten, I supposed twenty lines to an inch, and, consequently, that four hundred letters would be contained in a square inch. A concave sphere then of six feet diameter would contain six million five hundred and fourteen thousand and four hundred letters. This number of letters the candle would illuminate, so that each would be distinctly visible to an eye at the distance of nine inches. Here I would just observe, that the candle was supposed to be so philosophically made, that, whilst it maintained a constant bright flame, it did not intercept its light from a single letter in the concave sphere.

Again, the light, reflected from a single letter, would render that letter visible to an eye at the distance of nine inches, not *in one direction only*, but to an eye placed any where in the concave surface of a hemisphere of nine inches radius. To how many eyes, then, is the light reflected from one letter, sufficient to render it visible?

I supposed the pupil of the eye to be one eighth of an inch in diameter, which is probably near the truth. On this supposition, the surface of a hemisphere of nine inches radius is equal to the pupils of forty one thousand four hundred and sixty-five eyes. To this number of eyes, or to half this number of pairs of eyes, the light reflected from a single letter is sufficient to render that letter distinctly visible. But here it may be objected, and it is true, that to an eye, placed near the plane of the leaf, a sufficiency of light would not be reflected. But it is also unquestionably true, that not half the light which falls upon the leaf is reflected. The light, therefore, which is absorbed, would much more than compensate for this deficiency.

Now, the light which falls upon a single letter being sufficient to render it visible to 20,732 pairs of eyes, and the number of letters in the concave surface of a sphere of three feet radius being 6,514,400, the light which falls upon all these letters is sufficient for 135,056,540,800 pairs of eyes, or the light of one candle, should not a particle be lost, and the whole be so distributed, that each should receive his equal portion, is sufficient to enable 135,056,540,800 persons to read at the same time. If our earth contains 900,000,000 of inhabitants, and that, I believe, is the highest supposition ever made, the light of one candle is more than sufficient to enable all the inhabitants of one hundred and fifty such worlds to be reading at the same instant. This conclusion, I am aware, will appear to many, perhaps to most, altogether incredible; but any one, possessing but a moderate share of mathematical knowledge, may in a short time easily satisfy himself, that, rejecting fractions, it is rigidly exact.

A candle like that, to which I have referred, would undoubtedly continue burning at least four hours. What quantity of light then, to be determined either by weight, measure, or the number of particles, will suffice for one person to read for one minute?

It will readily be perceived, that I have proceeded upon the supposition that the Newtonian theory of light is correct.

ON CANAL NAVIGATION, BY JOHN MACNEIL, ESQ.—We have been favored by a scientific gentleman of this city with a treatise on the subject of canal navigation, or the "*resistance of water to the passage of boats on canals*," by John Macneill, Esq., member of the Society of Civil Engineers, London, which gives a series of results that will appear incredible to those who are not familiar with great speed in canal navigation. There are many persons who will require further evidence before they will believe that navigation can be carried on on canals at the rate of 10 to 14 miles per hour, without injury to the banks, and that too on a canal narrower than the canals of this State; and many others who will hardly credit the theory, that the resistance will be less on a *narrow* than *broad* canal; yet such appears to be the opinion of those who have examined the subject, and experimented upon it. The following is the introduction of Mr. Macneill.

The results which I have arrived at by experiments are so much at variance with generally received theoretical deductions, that it is with much diffidence I submit these pages to the consideration of the public, and to those more immediately concerned in Inland Navigation. The following observations are made with a hope that those discrepancies between theory and practice may tend to a more rigid adherence to experimental inquiries in other branches of practical science, but especially, that they may lead to a more varied and extensive series of experiments to ascertain the best form of boats, not only at the cost of public companies, whose canal property may well demand it, but also at the expense of government, who lay out large sums in steam navigation; for I trust it is clearly shown, that very great alterations and improvements may be made in the models of all ships and boats which are not impelled by the wind, and that passengers and light goods may be carried by canals at a velocity hitherto supposed to be impracticable.

On the Resistance of Water to the Passage of Boats on Canals, &c.

The laws which regulate the resistance and impulse of fluids are involved in such obscurity, that candid investigators of this branch of science are compelled to confess that the dissertations of the physico-mathematician have failed in utility, and that even the deductions of the logician have been almost altogether ineffectual. The assumptions of the former, from which propositions have been deduced, and theories given out, are, at best, founded only on an hypothesis; the reasonings of the latter rest upon limited experience, and, in some cases, ill observed phenomena. And there is probably no branch of science which has so much engrossed the attention of the philosopher, and from which so little practical good has resulted.

That such is the fact, and that the farther the subject has been investigated, the more difficulties have been met with, if not always acknowledged, few can venture to deny.

If, in his zeal for information, the inquirer of the present day searches the shelves of philosophy, his labor will terminate in the settled conviction, that this branch of science is but yet in its infancy, even although illustrated by the novel algebraical calculus, and the beautiful results derived from it by French ingenuity. A long course of patient experiment will alone warrant the adoption of formulæ; for as yet, as far as regards the mere resistance of the fluid, the practical application of the laws founded by the mathematician has failed in producing any form which will rival the skiff of the Indian, the canoe of the Esquimaux, or the junk of the Chinese.

These observations apply to all boats and ships impelled by any other force than the wind; and this must not be forgotten, whilst we proceed to examine one particular department, viz. canal navigation. Every body moving in or upon the water, it will be seen, is under similar laws; and although the following results apply particularly to canal boats, they, nevertheless, are applicable to every other body which has to make its course by water.

The object immediately in view, when we place a boat or barge upon water, is a good conveyance for persons and property. So is it when we place a wheeled carriage upon a gravelled road, or a sledge upon snow. The difference, however, in the modes of attaining this object, has been most striking. In each of these cases, the body to be moved has been rested on soft or yielding matter, and whilst, in the two latter cases, no mechanician would provide for the wheels of the carriage, or the runners of the sledge, a facility for cutting along, immersed in the softer matter under them, the boat builder seems to have studied how he could best keep his vessel ploughing her way. The case may be different with sea-going vessels, which are impelled by the action of a wind "on the beam," and ships of war, with their decks loaded with weighty guns; in such cases it is necessary that the vessel be a good deal immersed. Nor can it be satisfactorily shown, that even sea-going ships would not be improved by such a build as would enable them to rise to the surface of the water. But to pursue our *reductio ad absurdum:* there are many cases in navigation, where a sharp "cut-water" shape to a boat would be as unphilosophical as a knife-edged felloe would be to a wheel intended for ploughed land. A cart-wheel will, on gravel or other yielding matter, sink to the determined line of gravitation with as much certainty as will a boat upon water; and a boat resting in water will (according to the velocity given to it, and the form of its prow and bottom,) rise nearer the surface of the water, as well as a cart-wheel will rise

when put rapidly into motion. The difference of density is, no doubt, much greater in one case than in the other; but the water will resist the penetration of the boat in the same manner, though not in the same degree, as the soft gravel or mould resists the wheel. Notwithstanding a conclusion so obvious to those who know the laws of gravitation, and the properties of matter, so easily calculated by every one who understands any thing of the combination of forces,* we find it has been neglected in order to determine what law regulates the movement of a body immersed to the same depth, at all velocities.

At a time when it was generally held, that the resistance to a vessel in the water increased in the duplicate ratio of the velocity of the vessel through the water, the now keenly contested merits of railway transport, and canal transport, were brought under public discussion. Experiments were instituted in order to confirm this law of resistance, but it occurred to none of the experimentalists that, although they could not increase the density of the water, or harden it, as has been done with roads for carriages, that they could still increase the relative resistance of water, by giving the boat such velocity that her prow could not penetrate fast enough, and thus that she should rise out of the fluid. They might have reasoned, by a perfectly fair analogy between conveyance on land or on snow, and conveyance on water, and have legitimately concluded that, as their object was not to cut through gravel, but to get on it, in the one case, so at high velocities in the other, they should not have endeavored only to cut through the water, but also to raise the boat to the surface, and make her skim thereon.

Such facts are obvious to all, who have seen a boy make a thin stone skim the surface of a lake, — who have watched the action of a cannon ball on the smooth sea,—who have felt the difficulty of making any impression upon the stream forced from the small aperture of a fire-engine hose-pipe, — or, indeed, who know any thing of the properties of matter; but they had never been applied to the purposes of navigation, until it occurred to Mr. Houston, of Johnstone Castle, to try the effect of a light gig-shaped boat upon a canal; and it is very surprising that the most strenuous advocates for the adoption of such boats still reject the above facts, as irrelevant. It matters not whether the water be forced against the object, or the object be forced against the water.

In the month of June, 1830, Mr. Houston succeeded in having a light, long, and shallow wrought-iron canal boat established upon the Ardrossan canal, in Scotland, between Paisley and Glasgow. Since that period, such boats have continued to run regularly, conveying about sixty passengers a distance of "twelve miles, at a rate of eight miles an hour, stoppages included." Succeeding improvements in the construction of the boat, as well as in the mode of working the horses, enable us to state the above as a minimum of performance. In the Appendix (A) will be found a specification of one of such boats, and figure 2 will show their form and dimensions. The following quotation from the advertisements, the truth of which is well authenticated, shows the cheap rate of conveyance.

	Distance.	Cabin.	Steerage.
"Fare between Glasgow and Paisley.....	8 miles.	9*d.*	6*d.*
Fare between Glasgow and Johnstone.....	12	12	9
Fare between Paisley and Johnstone.....	4	5	3

Intermediate distance as in the way-bill.

"The boats, at times, carry twelve hundred passengers in one day; and during eight months of last year, (1832,) notwithstanding the prevalence of cholera, they conveyed one hundred and twenty-six passengers, which is at the rate of fifteen thousand seven hundred and fifty, monthly."

Mr. Thomas Grahame, in his "Letter to Canal Proprietors and Traders," says, "The experiments of great velocity have been tried and proved *on the narrowest, shallowest, and most curved Canal in Scotland*, viz. the Ardrossan or Paisley Canal, connecting the city of Glasgow with the town of Paisley and village of Johnstone, a distance of twelve miles." The result has disproved every previous theory as to difficulty and expense of attaining great velocity on canals; and as to the danger or damage to the banks of canals by great velocity in moving vessels along them.

"The *ordinary speed* for the conveyance of passengers on the Ardrossan canal, has for nearly two years been *from nine to ten miles an hour*, and *although there are fourteen journeys along the canal per day, at this rapid speed, the banks of the canal have sustained no injury.* * * * * * The boats are formed seventy feet in length, about five feet six inches broad, and, but for the extreme narrowness of the canal, might be made broader. They carry easily from seventy to eighty passengers, and when required, can, and have carried upwards of one hundred and ten passengers. The entire cost of a boat, and fittings up, is about £125. The hulls are formed of light iron plates and ribs, and the covering is of wood and light oiled cloth. They are more airy, light, and comfortable, than any coach. They permit the passengers to move about from the outer to the inner cabin, and the fares per mile are *one penny* in the *first*, and *three farthings* in the *second cabin*. The *passengers are all carried under cover*, having the privilege also of an uncovered space. These boats are drawn by two horses (the prices of which may be from £50 to £60 per pair) in stages of four miles in length, which are done in from twenty-two to twenty-five minutes, including stoppages to let out and take in passengers, each set of horses doing three or four stages alternately each day. In fact, the boats are drawn through this narrow and shallow canal at a velocity which many celebrated engineers *had demonstrated, and which the public believed to be impossible.*"

Mr. Grahame then proceeds making apparent his want of confidence in railways— "The entire amount of the whole expenses of attendants and horses, and of running one of these boats four trips of twelve miles each (the length of the canal) or forty-eight miles daily, including interest on the capital, and twenty per cent. laid aside annually for replacement of the boats, or loss on the capital therein invested, and a considerable sum laid aside for accidents and replacement of the horses, is 700*l.* some odd shillings, or taking the number of working days to be three hundred and twelve annually, something under 2*l.* 4*s.* 3*d.* per day, or about 11*d.* per mile. The actual cost of carrying from eighty to one hundred persons, a distance of thirty miles, (the length of the Liverpool railway,) at a velocity of nearly ten miles an hour, on the Paisley Canal, one of the most curved, narrow, and shallow canals in Britain, is therefore just 1*l.* 7*s.* 6*d.* sterling. Such are the facts, and incredible as they may appear, they are facts which no one who inquires can possibly doubt."

The following is a statement I am enabled to publish showing the gross expense of running old heavy boats on the Paisley canal at the rate of four miles per hour, and new light boats on the same canal at the rate of ten miles per hour, and the comparative expense per mile; also the number of passengers carried before and after the introduction of the high and cheap speeds.

	Speed pr. hr.	Number of passengers carried.	Number of miles run each day.	Whole expense per year.	Cost per mile, year taken at 312 days.
1830* . .	4	32831	48	700*l.* 4*s.* 7*d.*	11*d.*
1831† . .	10	79455	vary'g	1316*l.* 17*s.* 5*d.*	—
1832† . .	10	148516	152	2121*l.* 5*s.* 11*d.*	10*d.*

The power of conveyance thus established on the Paisley canal, may be judged of from the fact that on the 31st of December, 1832, and 31st of January, 1833, there were conveyed in these boats nearly 2,500 passengers.

The number of passengers continue to increase. The number carried in April, 1833, was twenty thousand, or at the rate of two hundred and forty thousand yearly.

It does, therefore, appear surprising, that canal owners in particular, whose property was daily becoming less valuable in the share market, by the alleged superiority of railway conveyances, should have been so blind or supine as to allow nearly three years to pass over, without making vigorous efforts to follow the successful example; but it is not the less true that they were, and indeed are still so; although, if the system be a good one, and practicable, and lucrative, as to me it appears undoubtedly to be, they could not have hit upon a more happy arrangement for keeping up their dividends, and for improving their property to a greater extent than it has arrived at, since the commencement of canal navigation in England. In many situations throughout the kingdom, where the quick transit of passengers, and even of light goods, was of consequence, it would not only enable the canal companies to compete with existing turnpike roads, but also to supersede the necessity for railways for general purposes.

We must suppose that canal proprietors did not credit the various reports in circulation as to the speed at which the boats were drawn upon the Paisley canal, the ease with which horses perform their work, and the small surge produced on the sides of the canal. But even supposing many of these reports to be exaggerated, and that false conclusions were come to by those who witnessed the performance, the great points of speed and economy were established to the satisfaction of many inquirers. Had the facts been known to canal proprietors, we should have expected the institution of a series of experiments long ere this, for ascertaining the actual resistance of boats at high velocities, and under every

* We find a good illustration of this resistance in "A Winter in Lapland and Sweden by Arthur de Capell Brooker, 1727," p. 338.—"The real superiority of the skielobere is chiefly shown when the enemy halt after a long march. Whatever precaution may then be taken, they are in constant danger from troops which have no occasion for path or road, and traverse with indifference marshes, lakes, rivers, and mountains. Even in those parts where the ice is too feeble to bear the weight of a man, the skielobere glides safely over, by the more rapidity of his motion.

* These charges are the bare outlays.

† These charges include loss on purchase and sale of additional horses, and ten per cent. on cost of horses, boats, deposited in a contingent fund.

Figure 1.

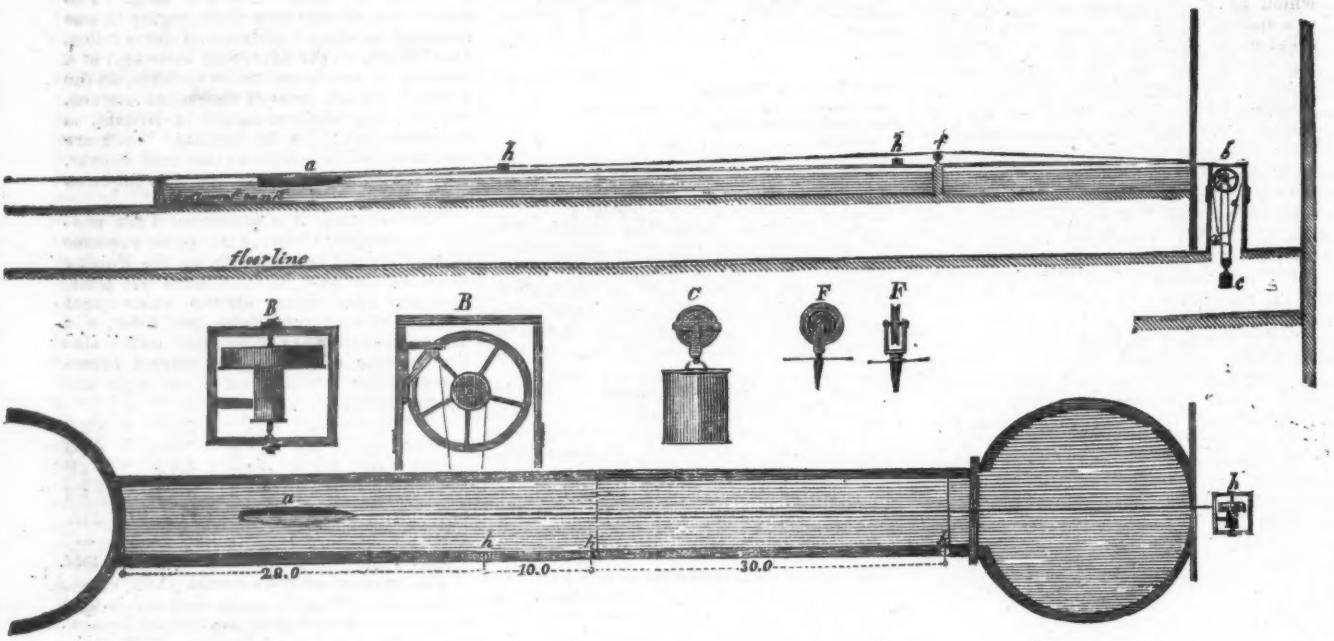


Figure 2.

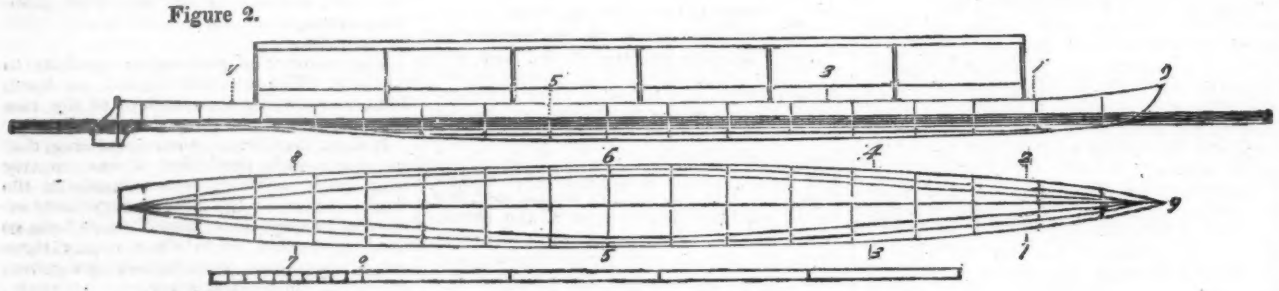
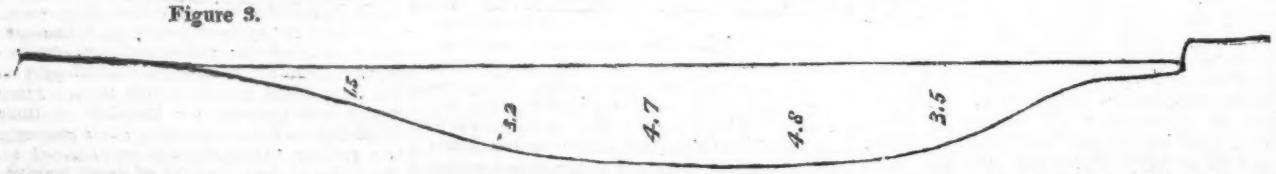


Figure 3.



variety of circumstance, as well as the best form of boat suited to these velocities; the height of the wave or surge, as well as its character and effects, and many other important features, which were now for the first time exhibited.

It is most unaccountable why canal companies did nothing to determine such; and it is to be hoped they may now be induced to institute extensive experiments. The few experiments which are detailed in the following pages, though made with as much accuracy as circumstances would admit, and though they are conclusive on some points, are by no means as extensive and varied as the importance of the subject demands. The scale of expenses was so exceedingly limited that they could not be carried farther, and others of still greater importance have not, in consequence, been undertaken, and remain yet to be made.

The energy and inquiring habits of Mr. Telford would not let such a practically useful inquiry remain dormant. He therefore directed me to make some preliminary experiments on a small scale, and to his liberality we are indebted for the first series, which were made entirely at his expense, in the National Gallery of Practical Science in Adelaide street; where the arrangements of the room were so admirable, and the accommodation, which the managers of the Gallery always gave for uninterrupted experiment during three weeks, was such,* that the most accurate results were obtained on a limited sheet of paper.

Figure 1 represents the plan and elevation of the reservoir of water in the National Gallery of Practical Science in Adelaide street, with the apparatus which was fitted up by Mr. Saxton, for the purpose of making the experiments. The straight part of the reservoir is seventy feet long, and four feet wide, with upright sides. The wheel and axle, B & *b*, were of excellent workmanship; the axle on which the weight acted was of hard wood, three and a half inches in diameter, and the wheel on which the line that pulled the boats was coiled, was of brass, thirteen inches in diameter; the axis on which the wheel and axle turned was of polished steel, half an inch in diameter, working in brass. The pulley or sheave F, *f*, which was attached to the tin box or can, C & *c*, which held the weights, was of brass, two and a half inches in diameter, and its axis was of steel, with conical points working in brass. The line used for the weight was of cat-gut, one eighth of an inch in diameter, and the lines used for pulling the boats were, in some of the experiments, of silk, in others hemp, varying in thickness from one fortieth to one twentieth of an inch in diameter. The tension of the line in each experiment, or the force which was exerted on the boat by a given weight, placed in the bucket C & *c*, was not determined by calculations, but practically and accurately ascertained, not only by a spring dial placed on the line as at *f*, but also by an accurate beam and scales, furnished by Mr. Simms; by which means any mistake or inaccuracy in estimating the quantity of power was effectually prevented. The boat is seen at (*a*, *a*,) as she appeared in her passage from one end of the straight canal to the other; the moving power being the weight in the bucket (C & *c*.)

In making some preparatory experiments it was found that a considerable space was necessary to be passed over by the boats, from the point of starting, before they ac-

* Every gentleman who witnessed the experiments, and saw the facilities with which the Committee and their manager, Mr. Payne, gave, agrees with me in bearing testimony to the liberal and philosophical spirit with which we were aided. They not only allowed a large portion of the gallery to be set apart, and put themselves to considerable inconvenience, but ordered the free admission of all persons interested or assisting in the experiments.

quired a uniform velocity. It was therefore found necessary to limit the distance over which the uniform motion was measured, to a space of fifty feet, and consequently, great accuracy was necessary in determining the time of the boat's transit over so short a space. I therefore applied to my friends, Messrs. Arnold and Dent, the celebrated chronometer makers, in the Strand, who, with that liberality which usually accompanies science, not only furnished me with chronometers, but Mr. Dent himself, more than once, assisted in measuring the time, and comparing it with that observed by Mr. Turnbull and Mr. Bourns, whose accurate and careful observations have contributed so much to the success of these experiments.

Occasionally two, and sometimes three chronometers were used, placed as at (*h*, *h*,) on brackets, screwed to the side of the reservoir, at the commencement and at the end of the measured space.

Close to these chronometers, and exactly at fifty feet apart,* two brass wires were stretched across the reservoir, at eight inches above the surface of the water; by means of which wires the observers could determine the exact instant of time that the bow of the boat came under them, as they were slightly touched by a slender piece of brass wire, rising perpendicularly from the stem of the boat.

In some of the first experiments it was found extremely troublesome to ascertain the exact interval of time of the boats passing between the wires, in consequence of the chronometers having different rates of going; but this difficulty was obviated by a suggestion of Mr. Cubitt, who proposed that after a certain number of experiments, the place of the chronometers should be changed, and the experiments repeated. This effectually obviated the difficulty, and enabled us to get the time with great precision. In the latter experiments, only one chronometer was used; it was placed on the bracket at the first wire, and a line was brought from the second wire, along the side of the reservoir, up to the point: by which means, the observer, holding the line in his hand, and keeping his finger on the wire next him, was enabled to ascertain by the touch, the passage of the boat under each wire, and the exact time intervening between each wire, by counting the number of beats of the chronometer. These experiments were frequently repeated, and the times noted by different observers, without communicating the results to each other, until each series was completed, after which they were compared, and the mean time taken.

In making the experiments, the line was made fast to the stem of the boat, which was then drawn to the farther end of the reservoir; the required weight was put in the bucket, and on a signal being given, the boat was disengaged, and drawn by the weight in the bucket to the opposite end of the reservoir, where it was stopped by a bag of cork shavings (*f*). In some of these experiments an additional weight was allowed to act on the boat for the first twenty feet, in order to get up the velocity; then it was cut off, and the boat went on with the uniform velocity; this was accomplished by putting a ring of lead (*x*), weighing 20 pounds, on the top of the bucket holding the weights, and making this ring fast by four lines to the upper frame work, these lines being of sufficient length to allow the ring to act on the bucket, and to descend with it through a given space.

* In most of these experiments this distance was reduced to 30 feet, as shown in the "general plan."

TABLE I.—Experiments made with different models over the sheet of water in the National Gallery of Practical Science, London, for the purpose of ascertaining the law of resistance, or force of traction at different velocities.

The boat used for the experiments was 10 ft. 2 inches long, 8.5-10 inches broad at water level, 3.5 inches deep, and when empty immersed 1.5 inches, and weighed 22.19 lbs.

In the first series of eight experiments, 17.06 lbs. of shot were placed in the centre of the boat, making its weight 39.25 lbs., and a line made fast to the boat, extended the length of the reservoir of water, and over a pulley, with one lb. weight attached to it. The length of the canal or reservoir in which the experiments were formed was 70 feet; but the space marked out to be passed over with a uniform velocity was 30 feet; the first part of the space being used merely to attain headway. The shortest period of passing the 30 feet marked off was 9.4-10, and the longest 10 seconds, giving an average rate of 2.089 miles per hour—with a force of traction or weight on the towing line during each experiment of 0.468 lbs. and an average difference of +0.40 between theory and experiment.

In the second series of eight experiments, boat, load, and distance same as above, with 5 lbs. weight attached to the cord, the time was 7.0—7.0—7.0—7.0—7.20—7.4—7.0—7.0 seconds, and the average velocity 2.802 miles per hour—and the force of traction, or weight on the towing line, during each experiment, 1 lb., with a difference between theory and experiment of —0.102.

In the third series of eleven experiments, the boat, load, and distance same as in the first and second series, with 10 lbs. attached to the cord, time in seconds of passing the 30 feet with uniform velocity was 6.2—6.2—6.0—6.4—6.2—6.2—6.4—6.2—6.0—6.2—6.4—with an average of 3.290 miles per hour, and a force of traction of 1.718 lbs.—or weight on the towing rope during each experiment, giving a difference of —0.556 between theory and experiment.

In the fourth series of ten experiments, boat, load, and distance same as above, with 20 lbs. weight attached to the cord, the time in seconds of passing 30 feet was 4.0—4.2—3.8—3.4—4.0—4.0—4.0—3.8—4.0—4.0 seconds, or an average of 5.232 miles per hour, with a force of traction, or weight on the towing line during the experiments—giving a difference of —0.216 between theory and experiment.

In the fifth series of nine experiments, boat, load, and distance same as in preceding, with 40 lbs. weight attached to the cord, the time in seconds of passing 30 feet was as follows: 2.8—2.8—3.0—2.8—3.0—2.8—2.8—2.8—2.8 seconds, or an average of 7.196 miles per hour, with a force of traction, or weight on the cord, of 5.812 lbs. during each experiment, and —0.251 between theory and experiment.

In the sixth series of six experiments, boat, &c., as in preceding experiments, with 60 lbs. attached to the cord, the time of passing 30 feet was as follows, viz.: 2.2—2.0—2.2—2.2—2.0—2.0 seconds, or an average of 9.607 miles per hour, and force of traction of 8.500 lbs. on the towing line during each experiment—with a difference of +1.412 between theory and experiment.

In the seventh series of three experiments, weight of boat and cargo 53.06, distance 30 feet, with 10 lbs. weight attached to the cord, the time of passing 30 feet was as follows, 7.0—7.2—6.8; making an average of 2.932 miles per hour—force o traction, or weight on the towing line 1.718—giving a difference between theory and experiment of —0.800.

In the eighth series of five experiments, boat, cargo and distance same as in preceding series, with 20 lbs. attached to the towing line, the time of passing 30 feet was as follows: 5.4—5.2—5.4—5.4—5.2—making an average of 3.845 miles per hour, with a force of traction, or weight on the towing line, of 3.156; making a difference between theory and experiment of —1.568.

In the ninth series of eight experiments, the boat weighing 22.19 without load, the distance passed over, and weight attached to towing line, same as in the preceding, time of passing 30 feet was as follows, viz.: 3.0—3.0—2.9—3.2—3.1—3.2—3.0—3.2—at an average rate of 6.660 miles per hour, with a force of traction, or weight on the towing line during each experiment, of 3.156; making a difference between theory and experiment of + 1.608.

In the tenth series of four experiments, or from the 69th to the 72d, the boat, distance, space and weight, attached to the rope same as in preceding, the time of passing over 30 feet was as follows, viz.: 3.0—3.0—3.1—3.0, at an average rate of 6.763 per hour, with a force of traction, or weight on the towing line, of 3.156; making a difference between theory and actual experiment of + 1.756. In this series, an additional 10 lbs. weight was added for the first 30 feet of the canal, to bring the boat to her full speed, before reaching the measured space of 30 feet.

In the eleventh series of seven experiments, or 73 to 79 inclusive, the boat, load and space passed over, same as in the first series, with a weight of 20 lbs. attached to the line, the time of passing 30 feet was as follows, viz.: 3.4—3.6—3.8—3.4—3.6—3.6—3.8, at an average rate of 5.691 per hour, with a force of traction, or weight on the rope, during each experiment, of 3.156, giving a difference between theory and experiments of +0.322. In this series an accelerating force of 10 lbs. was added during the first 20 feet of the canal.

In the twelfth series, or from 80 to 82 inclusive, boat, load, space and power, (except the 10 lbs. additional,) as in the preceding, time as follows: 3.8—4.0—3.6, with an average of 5.392 per hour, and a power of traction of 3.156, and a difference of —0.034 between theory and experiment.

In the thirteenth series, from 83 to 87 inclusive, boat, load and space same as in preceding, with 40 lbs. weight, (and 10 lbs. additional to 86 and 87,) the time in passing the thirty feet was as follows, viz.: 2.8—2.7—2.7—2.7—2.7—with an average speed, of 7.521 miles per hour, force of traction of 5.812; making a difference between theory and experiment of + 0.263.

In the fourteenth series, or from 88 to 92 inclusive, boat, load and space same as in preceding, with 70 lbs. attached to the rope, the time of passing over the 30 feet was 1.9—1.9—1.8—1.6—2.0—with an average rate of 11.180 miles per hour, power of traction 9.863; making a difference between theory and experiment of +3.561.

In the fifteenth series, from 93 to 101 inclusive, boat and space same as in preceding, and in No. 1, with 80 lbs. attached to rope, the time of passing 30 feet was as follows: 1.9—1.8—1.8—1.8—1.8—1.6—1.6—1.6—1.6—or an average of 11.928 miles per hour, and a power of traction of 11.217, and a difference between theory and experiment of 4.063.

The following experiments are given in full as contained in the table, and not, as in the previous descriptions, in a condensed form.

Number of Experiments.	Weight of Boat and Cargo.	Space passed over.	Time.	Miles per hour.	Moving Power.	Force of traction, or weight on the rope.	Force of traction calculated as squares of velocities.	Difference between theory & experiment.	GENERAL REMARKS.
	lbs.	*feet.*	*seconds.*	*miles.*	*lbs.*				
102	30.25	30	3.1	6.598	40	5.812	4.675	—1.137	One weight was placed in the centre of the boat; another weight 18 inches from the centre, abaft; and another 15 inches from the centre, forward.
103	"	"	3.0	6.818	"	"	4.992	—0.820	
104	"	"	2.7	7.575	"	"	6.162	+0.350	
105	"	"	3.6	5.681	20	3.156	3.466	+0.310	
106	"	"	3.8	5.382	20	"	3.111	—0.045	
107	"	"	3.6	5.681	"	"	3.466	—0.310	
108	"	"	3.8	5.382	"	"	3.111	—0.045	All the weights placed within 18 inches of the stern.
109	"	"	3.8	5.382	"	"	3.111	—0.045	
110	"	"	5.6	3.653	"	"	1.433	—1.723	
111	"	"	3.1	5.382	"	"	3.111	—0.045	Weights distributed as in No. 102.
112	"	"	3.8	5.532	"	"	3.111	+0.045	
113	"	"	3.9	5.245	"	"	2.954	—0.202	Weights placed 18 inches from stern.
114	"	"	3.9	5.245	"	"	2.954	—0.202	
115	"	"	2.0	10.227	60	8.500	11.233	+2.733	Weights as in No. 102.
116	"	"	2.0	10.227	60	"	11.233	+2.733	Weights placed 18 inches from stern.
117	"	"	2.0	10.227	60	"	11.233	+2.733	
118	"	"	1.5	13.636	80	11.217	19.970	+8.753	Grahame boat model.—Weight of boat alone 22.19 lbs.; length, 10 feet 2 in.; breadth at water line, 8.5 in.; depth, 3.5 in.; do., immersed when empty, 1.5 in. One weight 24 in. from the stern; a second weight 24 in. more forward; and a third 24 in. still more forward.
119	"	"	1.6	12.784	80	11.217	17.552	+6.335	
120	"	"	1.5	13.636	90	12.619	19.970	+8.351	
121	"	"	1.4	14.610	90	12 619	22.294	+10.305	
122	"	"	1.5	13.636	90	12.619	19.970	+7.351	
123	"	"	1.5	13.636	90	12.619	19.970	+7.351	
124	"	"	1.4	14.610	100	14.021	22.924	+8.903	
125	"	"	3.8	5.532	10	1.718			
126	"	"	4.0	5.113	10	1.718			
127	"	"	3.6	5.681	30	4.359			Bell boat model. Weight 9 lb. 13 oz.
128	"	"	3.0	6.818	50	7.265			
129	"	"	3.2	6.392	50	7.265			
130	"	"	3.6	5.681	50	7.265			
131	"	"	2.6	7.867	10	1.718			Ardrossan boat model. Weight 6 lb. 3 oz. Length 5 feet. Breadth at water line 4 in. Depth 1.5 in. Depth immersed 0.5 in.
132	"	"	2.8	7.305	10	1.718			
133	"	"	2.6	7.867	10	1.718			
134	"	"	1.8	11.363	20	3.156			
135	"	"	1.8	11.363	20	3.156			

It will be observed in the above tables, that as the velocity was increased, the power did not require to be increased in any thing like the duplicate ratio, and that the difference shown in the above column, betwixt the theory of the duplicate ratio and the actual experiment, becomes greater as the velocity is increased. I select from these experiments the following as instances. They are not taken from the means, but from the *items* of the experiments themselves.

At a velocity per hour of

2.763 miles, I.	lb is required, or	.180 *more*	than the theory of the square.
3.682 "	3.156 "	"	.045 "	
4.289 "	3.156 "	"	.045 "	
10.785 "	9.863 "	"	2.583 *less*	
6.392 "	3.156 "	"	1.232 "	
12.784 "	11.217 "	"	6.335 "	

I call attention particularly to these individual experiments, in order that the wide deviation may be noticed, and serve to shake the confidence still entertained by the adherents of the old school, who cannot allow that a high velocity is attainable upon canals with economy—not that I consider the old law of the squares to be incorrectly stated. In so far as the boat remains immersed in the water to the same water line, that law may be correct; but that whenever the velocity of the boat is increased beyond a certain point, as will be seen hereafter, the boat emerges a little out of the water, and skims nearer the surface,—the transverse section of immersion being lessened. This will be proved as we proceed.

Such facts being obtained and found to differ so widely from the opinions of philosophers, it was exceedingly desirable that they should not go forth to the public without the fullest confirmation. Happily for science, Colonel Page, Chairman of the Kennett and Avon Canal Company, to whose exertions and liberality it is entirely owing, induced the principal canal companies in England* to subscribe towards paying the expenses of an extended course of experiments with a large boat. I accordingly proceeded to Scotland, and purchased one of the Paisley Canal Company's quick boats, the "Swallow," which we afterwards named the "Grahame and Houston," in compliment to the two gentlemen who have been so eminently successful in improving the canal conveyance of Scotland. Indeed, Mr. Grahame's letters on the subject of canal navigation will furnish the most satisfactory reason why we should have used his name for the boat.

With this boat the results exhibited in the following tables (II. III. IV.) were obtained on the Paddington canal, opposite Holsden Green. The important effects which they are calculated to produce in the minds of the unprejudiced, not only upon inland navigation, but to nautical science in general, have determined me to publish them in the fullest manner, giving every particular connected with their arrangement, as well as the names of those scientific gentlemen who assisted me, together with the names of the assistants from my own office, so that the most ample evidence of accuracy and care may be had. For more advantage will be derived by accurate trains of experiments than will follow from the assumptions of a mathematical century.

The first requisite was a good dynamometer for measuring the tractive force necessary to move the boat at various velocities, and as I showed a marked preference for my own, with which I had obtained such important results during my surveys of roads for the parliamentary commissioners, I shall give a description of it, in order that readers may be satisfied such preference was justly given.

The dynamometer or pirameter, I originally intended for measuring the draught of carriages on turnpike roads, and for this purpose I have used it very extensively under the Parliamentary Commissioners, for the London and Holyhead road, and elsewhere. The following is a description of the instrument, and in the appendix (B) will be found the opinions of competent judges upon its merits. When I at first endeavored to adapt Marriot's spring weighing machine, so as to ascertain from it the amount of the horse's draught, the stepping motion of the horse created a quick succession of vibrations, which completely prevent any one from reading off the figures indicated—and this confusion of vibrations will always prevent the simple adoption of any species of spring weighing machine. To remedy this inconvenience, and do away with the vibrations as much as was necessary, I applied a piston, working in a cylinder full of oil, and connected with the spring in such a manner that when any power or force is applied to it, so as to make the hand traverse the index, the piston is at the same time moved through the fluid. The connection of the spring and index with the cylinder is by means of a lever working on a pivot: the arms of the lever are of unequal length; the tail-piece of the spring and index is connected with the short arm; at the extremity of the long arm the piston rod is connected; the piston rod, after passing through a stuffing-box in the cap of the cylinder, is screwed into a piston or circular plate of thin brass, perforated with small holes; and out of one part of the circumference a square notch is cut, the use of which will be seen below.

By this construction, the resistance of the fluid to the piston, which acts at the extremity of the long arm of the lever, prevents the sudden jerks of the horse from being marked with those vibrations on the index so much to be avoided; at the same time the piston will move over a space proportioned to the intensity of the force exerted by the horse, and the same will be indicated accordingly upon the dial of the instrument; if the pulls follow each other in rapid succession, the piston will move slowly out, and the hand upon the index will turn round steadily and uniformly, until the power is balanced by the spring.

The dial is graduated in pounds, and decreases from zero upwards, in order to compensate for the increased force which the spring exerts in proportion as it is wound up; in consequence of this the index does not pass over equal spaces when equal forces are applied in different states of tension of the spring; the piston therefore will not pass through equal spaces in the cylinder, and the vibrations would consequently be greater in the higher numbers, because the velocity of the piston being less, the resistance to the piston in passing the fluid will be less, at the same time the power opposed to it is greater. To obviate this, and to make the index equally steady on all parts of the dial, a narrow slip of brass, formed into an inclined plane, is soldered to the inside of the cylinder, parallel to its axis, the largest (or highest) part of this inclined plane being at that end of the cylinder towards which the piston rises when the index moves towards the greater power. The notch which is said above to be cut in the circumference of the plate, (which traverses like a piston in this cylinder,) corresponds in size exactly with the largest part of this inclined plane; so that when the piston is at the upper end of the cylinder, the notch is completely filled up by the inclined plane; on the contrary, when the piston is at the lower end of the cylinder, the aperture is completely opened. By this contrivance the aperture through which the fluid is obliged to pass, as the piston moves from the lower end of the cylinder to the higher, is gradually contracted, and of course the resistance to the passage of the piston through the fluid is gradually increased, and thus compensates the

* The Grand Junction, the Kennett and Avon, the Aire and Calder, the Oxford, and the Leeds and Liverpool.

increased power of the spring; rendering the vibrations nearly uniform from the lowest to the highest power. This compensation is similar to that by which the fusee regulates and gives uniform power to the main-spring of a watch.

This instrument* was placed in the doorway of the front cabin, (which is about fourteen feet from the stem of the boat,) and in a line with the ordinary tugging hook; secured with wooden braces and screw nails in such manner as to be perfectly firm and steady, in some instances the towing line was made fast to the weighing bar of the dynamometer, and the power communicated directly to it. In other cases the towing line was made fast to a shackle on an iron lever, the fulcrum of which was the screw bolt which made the bar fast to the gunwale of the boat on the bow nearest the towing path; the power being communicated from the lever to the dynamometer by means of another shackle; this last mentioned shackle being precisely twice the distance from the fulcrum. By this arrangement we were enabled to bring either the whole tractive force to be indicated on the dial plate at once, or only one half that power, as we please, by merely shifting from one position to the other.

I consider this arrangement to be advisable, lest by any chance there should have been an error in the graduation of the dynamometer. To prove its accuracy, we repeated most of the experiments with and without the lever. If when the power was communicated to the weighing bar of the dynamometer, the instrument indicated the whole traction to be one hundred pounds, and if, when the power was communicated to the other shackle, the instrument indicated only fifty pounds, we were warranted in concluding, that as far as this experiment was concerned, the dynamometer was accurate. Now this I had done on numerous occasions, to prevent the possibility of error; and in order to be more perfectly assured I repeatedly employed weights, suspended, over a pulley, to check the dynamometer.

In making the observations with the dynamometer, every care was taken to have accuracy. Mr. Whitwell kindly assisted me in all these observations. He took the time with an excellent watch, having a detached second hand, with a dead beat, which enabled him to give a signal very accurately at intervals of two seconds. At these signals the power of traction indicated by the dynamometer was read off silently and distinctly by two gentlemen, whose names are at the head of their respective copies. Each of these gentlemen added the observations together, and took the means of each set.

Whilst these observations were making at the fore sheets of the boat, the times of the boat's passage were noted a little farther aft, by Mr. Turnbull and Mr. Dundas, who had each an excellent chronometer (from Arnold and Dent's.) The word "*time*" was given by Mr. Wilson, when the boat passed the stakes which had previously been driven in the embankment at distances of one hundred yards apart. By this means the observers of the time had never occasion to lift their eyes from the chronometers, except to note down the observations.

* In the modification of this instrument, which I have now mounted in a light double-bodied phæton, the dial plate is fitted, not only with an index and hand, but also with a card for determining the bearing; a pendulum which shows, by means of an index and hand, the inclination; a time-piece; and an index and hand to show the distance travelled by the wheels.

Besides the gentlemen making these observations, I was always assisted by others; but more especially by Mr. Alexander Gordon and Mr. Saxton, both of whom being so well qualified from their practical and scientific acquirements, for such a series of experiments, contributed very materially to prevent errors from taking place, by a general view over each department.

Fig. 3 represents a transverse section of the Paddington canal, opposite the village of Holsden Green; the soundings and measurements having been taken by Mr. Bourns and Mr. Turnbull.

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APPENDIX.

A.

Specification of a Light Iron Passage Boat, such as ply on the Summit Level of the Forth and Clyde Canal, between Port Dundas and Windford, and such as was used in the Experiments detailed in the foregoing paper.

Extreme length, 70 feet; do. breadth, 5½ feet. The iron of the very best manufacture.

The body plates in particular must be free from rust, cracks, blisters, and roughness of every description. The whole of the iron must be coated with linseed oil, previous to its being used. And the boat must be built under cover, so that the work may be kept dry until the boat is finished.

Although not shown on the plan, the said boat has a hollow keel, so as to prevent the lodgement of water beneath the floor, between the ribs. The stem and stern shall consist of bars of iron, six inches in breadth, and a quarter of an inch thick, which are hammered flat at the lower part to the breadth and thickness of the keel-plate, to which they are scarfed and secured with clenched rivets.

As stated above, the keel-plates are formed hollow, and consist of hoop iron, six inches in breadth, and one eighth of an inch in thickness. To which a wood keel of Memel plank, fifty feet in length, nine inches in depth, three inches in thickness next the bottom of the boat, and an inch and a half at the lower edge, tapered off to nothing at each end, must be secured to the keel-plates with glands an inch and a half in breadth, and a quarter of an inch thick, sunk flush into the keel, and screwed inside at the distance of three and a half inches apart.

The ribs shall consist of T and angle iron, and placed alternately at the distance of twelve inches from each other, and extending from gunwale to gunwale; after being bent to suit the curved form of the vessel, two rows of holes are punched on the flat side of the angle and T ribs to secure the body plates, and holes at convenient distances are punched through the upright flange to secure the false ribs for the inside lining.

The body-plates must consist of the best double rolled No. 16 sheet iron, two and a half lb. per superficial foot, and these sheets are in lengths of eight and ten feet. The first range of bottom plates which join the hollow keel, eight feet in length and 24 inches in breadth; the next two ranges on each side which form the bilge, ten feet in length, by twelve inches in breadth, and the range next gunwale, ten feet in length by eighteen inches in breadth. Particular attention is requisite, both with the view to the strength and appearance of the boat, that the whole of the body-plates be run in fair sheer lines from stem to stern, and that the lower edge of each succeeding length or range of plates cover the upper edge of their accompanying ones, three quarters of an inch, so that the boat in every respect may have the appearance of being clencher built.

The butts, or end joints of the plates, must be kept smooth, and meet on the centre of the T rib, and the joints of each succeeding plate be so shifted as to meet on the T rib nearest the centre of its accompanying ones. It must, however, be expressly understood, that previous to any of the plates being rivetted, a thin stripe of cotton cloth, dipped in white lead paint, be put in between the overlaps of the edge joint, and between the ribs and the end joints, so as to prevent leakage and corrosion. The whole end and edge joints must be secured with countersunk rivets, made from a three-sixteenth of an inch bore, placed at the distance of three fourths of an inch from centre to centre, and made from the best charcoal rivet iron; the rivets, except those for securing the end joints, must be placed two inches distant from each other, and the whole, as stated above, be countersunk, and kept as smooth as possible.

Plates, six inches in breadth, and one eighth of an inch in thickness, to be placed on each side along the bilge, over the body plates, where they are most exposed to injury when taking on board and landing passengers, which will extend from the round of the entry, at the bow, to the commencement of the run or exit at the stern, and is secured to the ribs and body plates with countersunk rivets, placed at the distance of three inches apart; but before they are secured, both the bilge plates and body plates must be properly coated with white lead paint, and a ply of sheathing dipped in the same, put in between.

One and a quarter inch of angle bars extend from stem to stern, to form the gunwale, to which welts or wood mouldings are secured; and another of the same dimensions to be placed seven inches below the gunwale, to which the wood-belting, three inches thick, and four inches deep round off, is to be secured.

The boat is framed and moulded, and in every respect formed exactly and agreeably to the plan, and the work must be done in a substantial and workmanlike manner.

Specification of the Carpenter and Joiner Work of such a Light Iron Canal Passage Boat.

The length of the boat as specified, at seventy feet in length, five feet six inches in breadth, and two feet six inches in depth. It is divided in the following manner, viz. Fore deck, 4 feet in length; fore sheets, space for steerage cabin and principal cabin, &c., and after sheets, according to the number of the travellers intended for; after deck, 4 feet.

The false ribs for securing the inside lining consist of willow timber, one inch in breadth, and seven-eighths of an inch in deepness, which must be free from knots and shakes, so that they may bend easily after being stoved to the curved form of the boat, to which they are secured with nails, rivetted to the upright flange of the ribs.

The sea-crofts, fore and aft, must extend from the stem and stern to the end of the cabins, and be four inches in breadth, and two inches in thickness, of best Memel plank, which is kept flush with the gunwale inside, and secured with three-eighths of an inch rivets, one throughout each rib.

Two timber heads on each side, near the bow and stern, are placed in the most convenient situation for mooring the boat, and secured with glands fixed with clenched rivets, so that the timber heads may be taken out and replaced when found necessary; to consist of solid oak timber, five inches in breadth, two inches thick, one foot in length below the gunwale, and seven inches above.

The beams which support the deck fore and aft, consist of oak plank two inches thick, three inches deep in the centre, and two inches deep at each end, with a curve of half an inch to the foot in length; and they are secured with a sheet-iron plate to the gunwale, angle iron, and sea-croft.

The gunwale or covering boards should consist of the best Memel fir plank, one inch in thickness, which extends from stem to stem; the cover is secured to the gunwale flange and wele that forms a moulding round the same.

The ends and divisions of the cabins should consist of Memel plank, two and a half inches in breadth, and one and three-fourths inch thick, which will form diagonal frames, for the purpose of strengthening the boat, so as to resist external pressures. The said frames must be lined at the ends of the cabins outside, with the best half-inch American yellow pine plank. The framing in the inside of the cabins may be lined as may be approved of.

The sleepers, for support of the flooring, should be two inches deep, by one and a quarter inch thick, placed and fitted to each alternate rib, and fixed to the upright flange with rivet nails. The flooring should consist of the best yellow pine plank, one inch thick, and not to exceed six inches in breadth, which must be properly cleaned, ploughed, and feathered.

The height of the cabins, from the top of the floor to the lower part of the beams, six feet at the centre, and the height of the sides above the level of the floor will be five feet under the beams, consequently the beams will have a curve of twelve inches.

The standards or stancheons of the sides of the cabins should consist of the best white American oak, one inch thick, and one and a half broad at the gunwale, and one inch in breadth at the top of the cabin, and placed at each alternate rib, to which it is secured, the distance being twenty-four inches from centre to centre. The top gunwale, for the support of the roof, to be made of the best Memel fir or red pine, free of blemish or knots, and extend the whole length of the cabins, two and a half inches deep outsides; the upper edge is bevelled to suit the curve of the beams, and two inches in thickness, mortised to fit the tenure of the standard, having a projection for a bead, and thickness of outside lining.

The beams, as stated above, to have a curve of twelve inches, to consist of the best clean ash timber, an inch and a half in breadth, by one inch in depth, the lower part rounded to a half-circle, and is placed at the distance of two feet from centre to centre, dove-tailed and secured to the gunwale with screw-nails; and a framing of iron wire gauze, well painted, shall be made to connect them, so that the top may form one solid connected form from end to end.

A stringer extends the whole length of the cabins in the centre to support the roof, which is let in, and bound to the diagonal frames, the upper edge kept flush with the top of the curve, consisting of clean solid white Quebec oak timber, three inches in depth, by an inch and a half thick; into which the beams are let nearly in the whole depth, and made exactly for the top covering.

The space outside of the cabin, fore and aft, must be lined from the floor to the gunwale with five-eighths of an inch red pine boards, and seated in the usual form; the tops seven-eighths of an inch thick, with round supports and cross bearers, with two front rails, two and a half inches in breadth, beaded, and let in flush with the bottom and top of the supports or feet.

In order that the boat may be kept as light as possible in the fittings-up, there should be no inside lining of wood from the floor up, consequently the whole seatings in the cabins must have fronts supported with brackets; these brackets to be secured to a stringer, fixed to the sides of the boat the whole lengths of the cabin, three inches in breadth, by an inch and a quarter thick, to which the brackets are let in flush, and nailed to it and the floor. The seats in the principal cabin to be sixteen inches in height, so as to allow cushions two inches thick and eighteen inches in breadth; the back to be one inch lower than the front, which is considered an improvement as a comfortable seat; the seats in the principal cabin may consist of cane, light wood, or lacing, as may be approved of; the fronts consisting of the best American yellow pine five-eighths boards. The seats in the steerage, eighteen inches in height, by fourteen inches in breadth, and fixed with brackets in the same manner as the principal cabin, and be seven-eighths of an inch in thickness.

The outside lining between the gunwale and top of the cabins should consist of the best yellow pine half-inch boards, well seasoned, free of knots, sound, and properly cleaned, ploughed, and feathered. The first board will extend the whole length of the cabins, eight inches in breadth, neatly joined to the covering boards, thin fitters being fitted between the standards or stancheons, and, laid in white-lead paint, so as to be water-tight, is fixed to the side standards with springs.

The space between the standards being twenty-four inches from centre to centre, it is proposed that light windows or patent gauze wire shall be placed in every alternate space, so as the passengers may have a view of the country without being under the necessity of removing to the outside. These windows and frames should be made as light as possible, and made to slide or fold, as may be considered most convenient.

The inside lining, from the seats up, and between the windows, should consist of oil-cloth, fixed and finished with beads and facings.

The top or cover of the cabins to consist of oil-cloth, which must be perfectly water-tight, and fixed to the beams, top gunwales, and ends of the cabin, with a moulding. It will be necessary to have a thin sheet of plate-iron for the funnels, so as to prevent any danger from the heat of the stoves during the winter.

The outside doors should consist of red pine plank, one inch and a quarter thick, bound and pannelled, to be hung with neat light bats and bands, have good five-inch rimmed locks, brass mounted, to open out in two halves, and to have small brass slip bolts at top and bottom. The doors in the divisions to have check locks, and hung with five-inch edge hinges.

The inside doors should consist of the best yellow pine plank, one and one-eighth inch thick, and twenty-two inches in breadth, and finished with facings.

That the whole of the inside, previous to the joiner work being commenced, should have two coats of good lead color paint, and the whole of the iron-work on the outside, as well as the wood-work in the outside and inside, should have three coats of paint of different colors, and finished in a sufficient and workmanlike manner. *(To be continued.)*

THE FLOWER SPIRIT.

I am the spirit that dwells in the flower;
Mine is the exquisite music that flies,
When silence and moonlight reign over each bower
That blooms in the glory of tropical skies.
I woo the bird with his melody glowing
To leap in the sunshine, and warble its strain,
And mine is the odor, in turn, that bestowing,
The songster is paid for his music again.

There dwells no sorrow where I am abiding;
Care is a stranger, and troubles us not;
And the winds as they pass, when too hastily riding,
I woo, and they tenderly glide o'er the spot.
They pause, and we glow in their rugged embraces,
They drink our warm breath, rich with odor and song,
Then hurry away to their desolate places,
And look for us hourly, and think of us long.

Who, of the dull earth, that's moving around us,
Would ever imagine that nursed in a rose,
At the opening of spring our destiny found us,
A prisoner until the first bud should unclose;
Then, as the dawn of light breaks upon us,
Our winglets of silk we unfold to the air,
And leap off in joy to the music that won us,
And made us the tenants of climates so fair!

[From the Apprentice's Companion.]

The following article shows conclusively the evils resulting to thousands of young men from beginning at the wrong end—or to speak more correctly, with the "chuckie," instead of the "drap parritch and milk i' the morning."

BEGINNING AT THE WRONG END.—It is justly observed by a modern writer, in alluding to the general ignorance of mankind respecting the wonders of creation, and the manifold objects for instruction and delight with which the Almighty has surrounded him, that the "*neglect of small things* is the rock on which the great majority of the human race have split;" and the aphorism is equally applicable to the domestic and worldly condition of very many individuals. Our readers must all, in the course of their lives, have known one or more persons, upon whose exertions for advancement in life an irremediable ban of misfortune appears to have been laid—who, with every advantage in their favor—natural ability, sober and industrious habits, advantageous situation, good connections, in short, every quality and opportunity by which people are generally supposed to raise themselves in the world—seem, nevertheless, doomed to a life of unrelieved poverty, hardship, and discomfort. Of these people, it is charitably said by their friends and connections, that "the world goes against them." They are represented as the victims of an unhappy destiny, against which it is in vain for them to strive; as beings, in short, specially excluded by Providence from all the chances of worldly prosperity and success enjoyed by their fellow-creatures. Leaving out of view the somewhat heterodox nature of this doctrine, as well as the pernicious and disheartening influence which the propounding of it must have on the minds of youth just preparing for the struggle of life, we will venture to say that nothing, generally speaking, can be more utterly hollow and fallacious than the conclusion here come to. That there are many really unfortunate people in the world, we are far from being inclined to dispute; nay, if the evil did not far outbalance the good fortune of life, it would not be what the Almighty decreed it—one of trial, disappointment, and suffering. But where men are driven back, or prevented from getting forward in the world by a downright series of misfortunes, these are generally so evident and palpable, as to be seen, understood, and sympathised with, by their fellow-creatures. With regard to the individuals above spoken of, on the other hand—those whom the world is said to "go against," and whose lagging behind their fellows in the career of life can be traced to no parti

cular cause—we are convinced that in nine cases out of ten their "unhappy destiny" is attributable solely to some flaw or imperfection in their own conduct or character. In short, we have great faith in the aphorism of the poet in these matters, that

"We make ourselves our own distress,
We are ourselves our happiness."

This fatal bar to advancement in life consists sometimes in a natural inaptitude for the business of it; but much more frequently from some mismanagement in the finance department — a miscalculation of expenditure to the "ways and means;" and, in others, a general want of attention to those little matters of economy by which (to use a homely phrase) the two ends are made to meet. We pointed out in a late number how imperceptibly, but fatally, the giving way to a habit of laying out small sums on unnecessary matters, eats up a man's means, and we daily see instances of families, who, with very limited incomes, by dint of sheer domestic management, not only make a more respectable figure out of doors, but appear even more comfortable and contented within, than others with double or triple their income. As one fact, however, is worth a thousand arguments in what concerns the practical matters of life, we will narrate an anecdote illustrative of the present subject, which was lately brought under our observation, and for the truth of which we can with safety vouch.

In a certain burgh, which it is needless to particularise, wonned a worthy couple, who, by dint of persevering industry, had realised a handsome competency literally out of nothing. Their family consisted of one son, whose proper settlement in a respectable way of doing, as they themselves had retired from the cares of business, was now almost their only earthly concern; and as they had proved, in their own persons, both the misery of poverty and the blessings of independence, they thought they could not do better than rear him to the same line of business in which they had themselves succeeded so well. In process of time, accordingly, Mr. Thomas —— was installed in suitable premises in an excellent locality of the burgh, and an ample and valuable stock of goods was laid in; he was well connected, and still better recommended through his father's influence; on the latter account, too, his credit stood high in the trading world. In short, no young man in his way of business could possibly start in life with fairer prospects of success. On his own part, nothing seemed wanting to fulfil the expectations entertained by his friends. He was a sober, industrious young man, regular and correct in his private habits, assiduous in attending to his business, and as his goods were both excellent and cheap, his customers every day increased, and every one thought he was rapidly and deservedly realizing a fortune. Guess the astonishment, then, of all and sundry, when, in about a year and a half after his opening shop, Mr. Thomas ——, or rather his worthy sire, found it prudent to close it again; and the friends of the parties learned, that the paternal funds were minus a good many hundred pounds by the speculation! Here was a poser for the trading quidnuncs of the place! The matter was to them perfectly incomprehensible. It seemed like that which had hitherto been supposed an impossibility in nature—an effect without a cause. Mr. Thos. —— had been universally reckoned a perfect pattern of what a man ought to be who wished to thrive in the world. In fact, he had been held up to all the young men in the neighborhood as a model whereby to fashion their own conduct. Neither was he of an adventurous turn of mind, nor had he met with any serious losses in trade to account for his "misfortune." As there was no feasible way, therefore, of explaining the matter, the usual verdict was, of course, passed upon the occasion—that, in spite of all Mr. Thomas ——'s efforts and industry, "*the world had gone against him.*" He was the victim of *ill-luck*, or, to speak out plainly the meaning of their words, he was one "doomed by Providence not to thrive in the world;" and all, therefore, agreed in the propriety of his parents withdrawing him, as they did, from the concerns of business to their little rural abode, as they said that "doing *nothing* was still better than doing *ill.*" Shortly after the event took place, a kind-hearted lady, who had been a steady customer and warm patron of Mr. Thomas ever since he "set up," and had all along admired his exemplary conduct, had occasion to call at his parent's abode about a servant's character, or some such matter, when she took the opportunity of expressing the surprise and regret of herself and friends at what had happened. "'Deed, Mrs. ——," replied the sorrowing dame, "I'm sure we're a' much obleeged to yersel', and other weel-wishers, for your concern about Tam; but, ye see, the world just gaed against him, and we thocht it better to keep what we had left than rin the risk of losing a'." As the visitor did not appear altogether satisfied with this explanation, and seemed anxious to learn in *what way* the world had gone against him, the other continued—"A weel, ye see, though Tam's a weel-behaved industrious lad, he just had na a way of managing things; and though he could *mak* siller easy enough, he wants the knack to keep it. I never could get him to understand the value o' siller, or to see that it was pence that made pounds—and the long and the short o't is that Tam, like many a ane, just *began the world at the wrang end!*" As this was a mode of proceeding through life which the lady had never heard of before, she begged a more particular explanation, and received the following, to which we would beg the particular attention of all young people in Mr. Thomas's situation. "Ye see, Mem, when the gude man and me began the world thegither, we were just as bare as we weel could be—hardly ae sixpence to rub against anither, and na a friend to gie us a helping hand. So, Mem, we just suited our way o' living to our circumstances, and contented ourselves wi' a drap parritch and milk i' the morning, a herring and a potato, or sae, to our dinner, and our parritch at nicht again. By and by, as we began to *mak* a little, we had some gude broth and meat at dinner time, and after that a wee, we ventured on a drap tea in the morning. As things got better wi' us, the gude man wad whiles send hame a lamb-leg for our Sunday's dinner; and od, Mem, before a' was dune, we used sometimes to treat ourselves to a *chuckie.* Now, ye see, Mem, our Tam took th clean contrairway o' going about things—*he began wi' the chuckie!*"

I now never hear of young men, placed in an advantageous situation for getting forward in the world, but who, nevertheless, and without any apparent cause for their bad success, are unable to "get their head above water," but I am apt to suspect that the have "*begun with the chuckie.*"

I am often induced, when see an apprentice boy, who gets $3, or $4 a week, to board and clothe himself with, attending parties and balls, with a dandy coat and gold chain, or dashing breast-pin in his bosom, to conclude that he has commenced with the "*chuckie,*" and cannot but believe, that, unless he alters his habits, he will yet come to the "*drap parritch and milk.*"

I am indeed often pained to see how large a portion of this world begin with the "*chuckie.*"

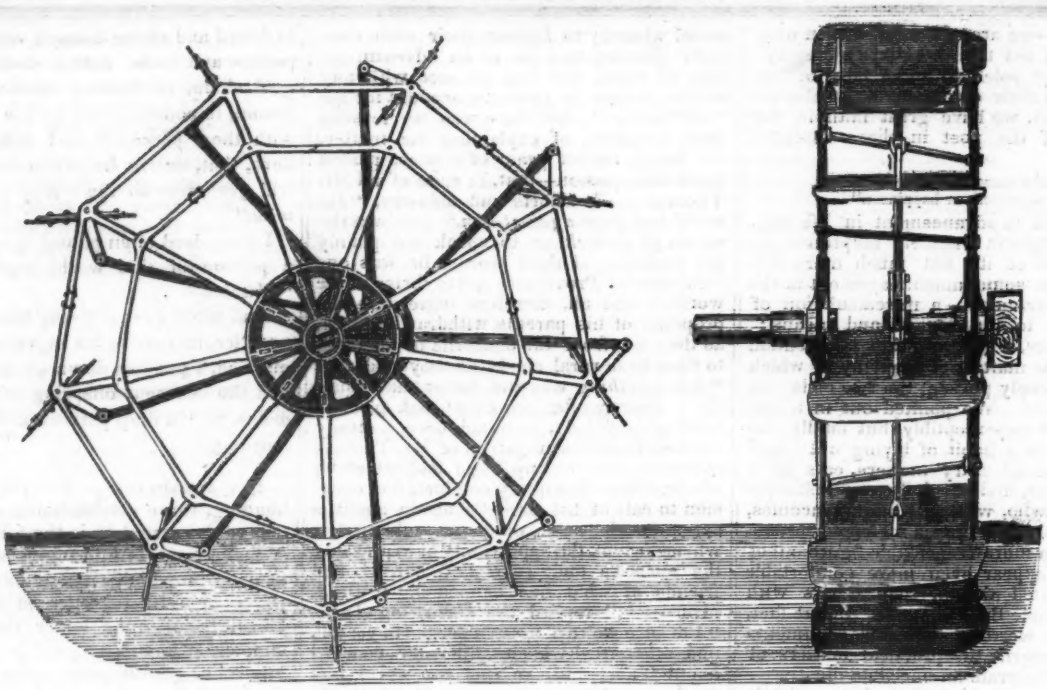
And when I see a young man, yet an *apprentice*, increasing his expenses by getting married, I put him down as destined, him and the innocent offspring of his imprudence, to "a drap parritch and milk i' the morning."

Pin Heading. — The process of pin-heading, three establishments for which I visited, is carried on in the following way: A large room is filled with small tables, at each of which sit four children, about thirty or forty together in a room, and certainly of ages lower than I should suppose it possible could be employed in any other gainful occupation. The majority of those I saw did not appear to be above seven or eight; and, in fact, the scene, as far as regards the ages of the children, reminded me more of an infant school than any thing else I had ever witnessed. A sort of frame is fixed before each child, on which is suspended a heavy weight, which is kept in perpetual motion by the child pressing its foot on a treadle beneath the table; and the continual thumping noise of which, close to the infant's ear, seems well calculated to produce the ear-ache, complained of by several witnesses. Each child is in a position continually bent in the form of the letter C, its head being about eight inches from the table, and both its hands engaged in taking up the shanks, and putting heads on them, which heads are then tightened by blows from the weight suspended before it. On the whole, the employment of pin-heading seemed to me the most irksome and monotonous, without exception, I had ever witnessed; and knowing the cruelties that are sometimes practised at it, to keep their infants at work, I was not surprised at being told by a manufacturer, that he had been once engaged in the trade, but had left it, owing to the disgust he felt at this part of the business.—[Mr. Tuffnell's Report, Factory Commission.]

[From the London Mechanics' Magazine.]

Morgan's Paddle-Wheel in its Latest and Most Approved Form.

The paddle-wheel now commonly known by the name of *Morgan's*, was originally invented by Mr. Elijah Galloway, and patented by him in 1829. The first trial made of it was on board a steam vessel, of which Mr. Wm. Morgan was the principal and acting owner, who was so much pleased with its performance that he became by purchase the proprietor of the patent. The Commissioners of the Admiralty were afterwards induced to order that a pair of



these wheels should be fitted by Mr. Morgan to H. M.'s steam vessel Confiance. On the 9th of September, 1830, Commodore Warren, accompanied by Mr. Lang, of the Dock-yard, Woolwich, proceeded down the Thames in the Confiance, on an official trial of the wheels. The Report made by the Commodore to the Admiralty, was, "That with 23½ revolutions of the engine, (24 to 25 revolutions being their regulated speed,) the vessel had improved in speed (as far as could be collected from so limited a trial) from 1 to 1½ knot an hour; that although the floats, in leaving at such rapidity, must necessarily disturb the water, so perfectly were the ill effects of the back-water obviated, that when the vessel was going at her utmost speed, he had caused a wherry, which was being towed astern, to be hauled up along-side, and close up to the paddle-box, without the slightest inconvenience, or without her shipping even a spray; and finally, that the previous vibration suffered from the action of the wheels was so reduced as to be barely sensible on the paddle-box itself."

On the 11th of September, Admiral Sir Geo. Cockburn embarked on board H. M.'s steam yacht, the Lightning, to proceed to the channel on an experimental cruise, H. M.'s steam vessels, the Confiance and Echo, being ordered to proceed in company. These three vessels were all fitted with engines of equal power, namely, 100-horse power each. The Lightning, however, having been originally laid down for a steamer, is fifteen feet longer, three feet narrower, and draws nearly two feet less water than either of the other two vessels, and from her superior swiftness and other qualities, was selected for H. M.'s steam yacht. The Confiance and Echo are in every respect sister vessels, were laid down from the same drawing, and were originally intended for gun brigs. The three vessels were started abreast by signal from the Vice-Admiral. The improvement in the Confiance was evident from the first starting, as she was enabled to keep even pace with the Lightning, whenever the revolutions of her engines reached 23, and to pass her whenever they exceeded that velocity. In this way they ran together to the Downs, where they anchored. The Echo, although previously of equal speed with the Confiance, fell back so rapidly, that at the expiration of the first hour, the Vice-Admiral made her signal to return, she being then two long miles astern. Hitherto the weather had been calm, and the water smooth.

On the 12th September the two vessels, Lightning and Confiance, were ordered to weigh, and to stand to the S. W., wind fresh, and sea rough ahead, circumstances in which the previous superiority of the Lightning had been most remarkable. The lead was now, however, very decidedly taken by the Confiance, whose gain over her competitor, under these circumstances, was about a half knot on seven miles per hour, that being the speed at which the Lightning was driven.

The following day the Confiance was ordered to New-Haven, and accordingly started at 8½ A. M., wind strong, and heavy sea from W. S. W. At 4 P. M., off Beachy Head, she passed H. M.'s steamer Carron, (which vessel had left the Downs five hours before her,) making the best of her way to Plymouth on set the behavior of the wheels, stated "that vice. Having performed the service required of her, the Confiance was ordered back to Woolwich, where she anchored September 14. The commander, Lieut. Belson, having been ordered to report on the improvement in the vessel's speed was proportionately greater in a sea-way than in smooth water; that the action of the wheels was no way impeded by that of the waves, since the variation in the velocity of the engines did not exceed one to two revolutions; that the vessel's way was never stopped; and that there was no sensible increase of vibration on the paddle-boxes during the gale, over the very slight tremor felt in smooth water."

The commanders of H. M.'s steam vessels Carron and Confiance having received orders to proceed on a further experimental cruise to Cape Clear, and thence round the Fasnet Rock back to Plymouth, these vessels, similar in every respect, excepting in their wheels, started from the Breakwater by signal from the Port-Admiral on the 1st of October, wind strong, and a rough sea from the W. S. W. In five hours the Carron was hull down astern. The Confiance anchored at Hamoaze on the 4th of October, and the Carron on the 5th. The Confiance performed in 54 hours the distance which occupied the sister vessel, the Carron, 84 hours in running. Independently of the great saving of fuel effected, namely, 10 bushels per hour on the time saved in running the same distance as the sister vessel, viz., 30 hours, other advantages have been secured by the modification in question, as may be collected from the reports officially made, jointly and separately, by Lieut. Potburry, then commanding the Confiance, and Lieut. Lapidge, in command of the Carron. In reply to the questions put to them by the Admiral commanding at Plymouth, in virtue of directions from the Commissioners of the Admiralty, these officers stated, "that the Confiance had, on a comparison of their respective logs, gained by the alteration in her wheels an increase

of speed of 2 knots on 7 in smooth water, and 2½ knots on 4 to 4½ knots in rough weather; that the action of the paddles did not bring up the engines or retard their velocity in a head sea; that in rolling, their action assisted in righting the vessel, and that the wear and strain, as well on the vessel as on the engines, was materially reduced."

The superiority of the new wheel was considered to be so decisively established by these trials with the Confiance, that Mr. Morgan was subsequently employed by the Lords of the Admiralty to apply it to the other government steamers—the Flamer, the Firebrand, the Columbia, the Spitfire, and the Lightning. We extract the following particulars respecting the performances of these vessels, from the evidence lately given on the subject by Mr. Morgan, before the select committee on Steam Navigation to India, and from the official reports of their respective commanders to the Admiralty:

The Flamer displaces 590 tons (including 120 for engines, 140 for coals, and 30 for stores); her cylinders are of 42 inches diameter, and 4 feet stroke; and her wheels 18 feet in diameter, and 5 feet 6 inches wide. When the vessel is deep, her wheels revolve from 14 to 20 times per minute in rough water, and 26 times per minute in smooth. When the vessel is light, the speed of the wheels is increased from 18 to 22 revolutions in rough water, and from 26 to 26¼ in smooth. The commander of the Flamer, Lieut. Bastard, in report of 23d January, 1834, says of the wheels, "in six weeks of most tempestuous weather, found them to act remarkably well, without even a single float being shifted."

The Firebrand was built on the same lines, and is of the same scantlings, as the Flamer, with the exception of having 9 inches more depth; she had also originally 20 horses more steam power. Her paddle-wheels were at first of the common sort, and then her velocity was three quarters of a mile less than that of the sister vessel, with wheels of Mr. Morgan's construction. But since the Firebrand has been supplied with Morgan's wheels, she has attained nearly the same speed as the Flamer; and this though her old engines have been replaced by a new pair, of no greater power than those of the Flamer—namely, two sixty's.

The Columbia, as originally constructed, displaced altogether 480 tons; her engines were of 120-horse power, and her wheels (of the common sort) 16 feet 6 inches in diameter, and 8 feet wide. Her performance was then from 14 to 16 revolutions per minute, when she was deep; and from 24 to 26 revolutions per minute when light; the weather in both cases favorable. Being afterwards supplied with a pair of Morgan's wheels, 17 feet in diameter, and 5 feet 2 inches wide, with a new pair of engines of only 100-horse power, and with 30 tons more of coal, making her total displacement 40 tons more than before, the wheels performed, in similar weather, from 20 to 25 revolutions per minute when she was deep, and from 26½ to 28 when light. "She obtains," says Lieut. Ede, her commander, "greater speed than with the superior power she had before and the old wheel. The new wheels save the engines."

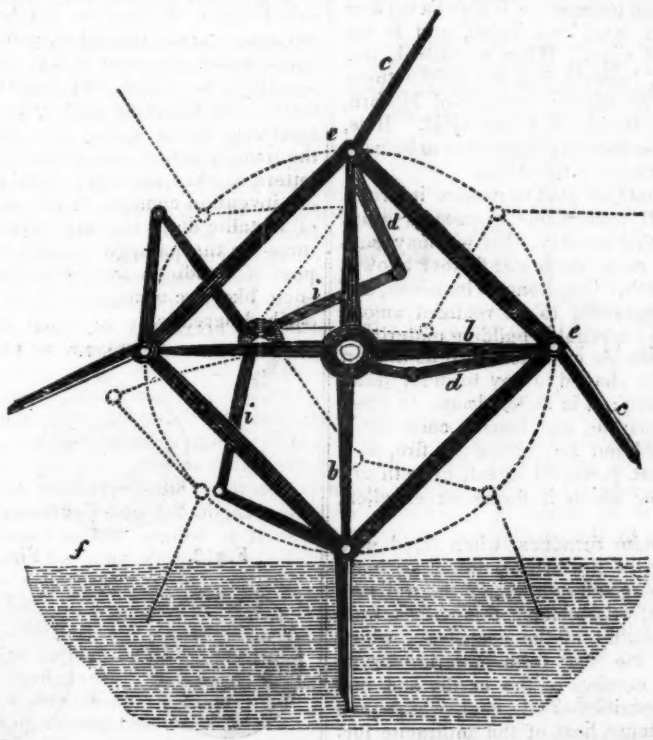
The Spitfire, with engines, coals, &c. displaces 715 tons; her engines are of 140-horse power, and her wheels 20 feet in diameter, and 4 feet 9 inches wide. Number of revolutions when light, and in smooth water, 23 per minute. Lieutenant Kennedy, the commander of the Spitfire, in his report, of date 3d December, 1834, says, "Had put to sea with the wheels in weather in which it would have been madness to attempt in any vessel with the common wheel, but that she had gone over it 4½ knots an hour, without scarcely feeling the wheels moved. With the old wheels would have been forced to put back, but had with these (Morgan's) made his passage from Gibraltar to Falmouth against a heavy gale nearly the whole way."

The Lightning has been before described. Her commander, Mr. Allen, in reporting on the effect produced on her rate of going, by the adoption of Mr. Morgan's wheels, says that "the speed was much improved in heavy weather," and "the vibration nearly done away with."

The wheels of the Medea, the largest war-steamer yet constructed by the British Government, the Tartarus, and Blazer, are also on Mr. Morgan's plan.

During the last summer, Mr. Morgan was employed to fit a pair of his wheels to his Sardinian Majesty's steam-vessel Gulnare; and it is from these wheels, the latest (we believe) manufactured by Mr. M., that the drawings have been made.

The wheel, as now constructed by Mr. M., embraces a good many improvements on the original design of Mr. E. Galloway. The most prominent difference is an increase in the number of radial arms and paddles, from four to nine. To show how much the wheel has gained from the successive modifications which experience has suggested, we here annex an engraving and description of it in its original form, as given by Mr. Galloway himself, in his "History and Progress of the Steam Engine":



"The object of this wheel is to provide a remedy for the loss of power, and other inconveniences arising from the oblique position in which the float-boards of the common paddle-wheels enter and leave the water. This the inventor purposes to effect by causing each float-board to turn, or rather vibrate, on an axis at its edge next the centre of the paddle-wheel, through the medium of projecting levers, firmly fixed to the float-boards, at their axis of motion, and connecting rods proceeding from the extremities of these levers to the extremity of a *fixed crank*, adjustable at a given distance from the centre of motion of the paddle-wheel, which consists of four radiating arms, connected at their extremities by strengthening braces; *b b* represent the four arms of the wheel, and *c e* the strengthening braces; *c c* are the paddles, firmly fixed to which are the levers *d d*, forming angles of about 120 degrees with each other, and turning together on axes at *e e*; *f* represents the water-line; *g* is the crank, fixed centrally to the axis of the wheel, but so as not to revolve with it; this crank is alterable at pleasure, by means of a set screw, which causes the paddles, through the medium of the connecting rods *i i i*, to take such an angle with the water-line as may be deemed

most desirable for propelling; the rods *i*, however, are connected to a revolving collar on the crank, which allows of free rotary motion, while it draws the paddles uniformly into the positions shown in the engraving, when the arm of the crank is set in a horizontal position, as represented. The dotted lines show the position the paddles assume in the intermediate parts of their revolution, or the relative position they would take if there were eight paddles attached to the wheel."

From the "American Journal of Science and the Arts," for January, 1835.]

SOAPSTONE OR STEATITE, OF MIDDLEFIELD.—This very useful material is found in many places in our primary regions. Middlefield, in Massachusetts, eighteen miles from Northampton, has long been known as affording it in abundance. A new quarry has been recently opened there, by Mr. William H. Butler, from whom we have received slabs and fragments. The quality is excellent, the substance is principally compact talc, and it is, (as far as we can judge from the specimens sent us,) remarkably free from foreign minerals. It gives a surface of uniform level and finish, and is cut with great ease. When varnished, fine colors are brought out, not unlike those of the Verd antique marble of Milford, near New-Haven, but less vivid. It is, however, sufficiently handsome to be used for the facings of fireplaces.

We should be glad to receive information of all remarkable masses of soapstone in this country, that we may contribute to make them still further known. The utility of soapstone is immense, and is only beginning to be realized among us. It is an admirable building material—cut with almost as much ease as timber, and readily shaped to any form for utility or ornament; it is as handsome as granite and marble, and houses constructed of it would not be injured by fire, as it resists that powerful agent, even in furnaces,† for which it forms an excellent lining.

Anthracite furnaces, when lined with it, instead of fire bricks, do not accumulate the slag and scoriæ, and the walls remain perfectly clean; this arises from the infusibility of the soapstone, which prevents the slag from adhering to it; the slag consists of the earthy and metallic impurities of the coal, which melt in the intense heat of the anthracite furnaces, and then adhesion takes place in consequence of the softening of the fire bricks at their furnaces, where they are in contact with the slag. Soapstone, on account of its infusibility, is also an excellent ingredient in pottery and porcelain; and magnesia, which is its characteristic ingredient, may be extracted from it by very easy chemical processes.

CEMENTS.—Mortar made of good lime and clean sharp sand may be successfully employed for the same purposes as Roman cement, provided it be allowed sufficient time to dry before water is permitted to rest upon it. This was mentioned many years ago by Arthur Young, in his "Agricultural Survey of Lincolnshire," and we have seen it proved in a variety of instances. In stuccoing the front of a house in or about London, for example, no builder need ever have recourse to any of the metallic cements, (including under this term *Roman cement, Parker's cement, Hamblin's mastic*, and all other quick-setting cements, which are only quick-setting in consequence of their containing some metallic oxide,) provided he can procure the best stone lime from Dorking or Aberthau. For our own parts, we should have more confidence in the durability of stucco so formed than in that of any of the cements. —[Mr. Loudon, Archit. Mag.]

[From the London Repertory of Arts.]

Specification of the Patent granted to RICHARD WALKER, *of Birmingham, in the County of Warwick, Manufacturer, for an Improvement in Wadding for Fire-Arms.*—Sealed June 26, 1834.

To all to whom these presents shall come, &c. &c.—Now know ye, that in compliance with the said proviso, I, the said Richard Walker, do hereby declare the nature of my invention, and the manner in which the same is to be performed, are fully described and ascertained in and by the following description thereof, reference being had to the drawing in the margin hereof, and to the figures and letters marked thereon: that is to say, my invention consists in the application of metallic discs (having suitable apertures for the passage of air) to the purpose of waddings for fowling pieces and such like fire-arms, as will be fully described hereafter.

Fig. 1.

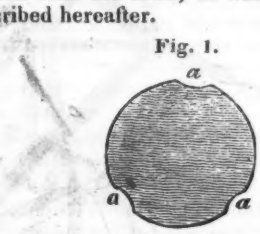


Fig. 2.

Fig. 3.

Fig. 1 represents a circular disc of metal, which is made to the size required for the bore of the intended fowling-piece, and in such manner as to touch the barrel all round except at the parts, *a*, *a*, which are apertures or openings, through which the air in the barrel passes, in the act of ramming down the wadding.

Fig. 2 shows another metallic wadding, having perforations, *b*, *b*, in place of the parts, *a*, *a*, cut out at the outer edges in fig. 1: and

Fig. 3 represents another wadding, having short slits, *c*, *c*, for the passage of the air. It will be evident, that the shape or form of the apertures will not be material, care being observed not to make them of such dimensions as will allow of the passage of the powder.

It will be evident, from the above description, that various advantages will be derived in the application of these metallic discs as wadding for sporting purposes, in place of the ordinary pasteboard, paper, or other wadding formerly employed. Amongst other advantages will be the close contact of the shot to the powder, and the consequent compactness of the charge. And it will be desirable to remark, that in ramming down such metallic wadding, it will materially tend to cleanse the interior of the barrel after each discharge.

Having thus described the nature of my invention, I would remark, that I usually form such discs as above described by means of the ordinary fly-press; and I usually cut them from thin sheets or plates of brass, from one hundredth to one hundred and twentieth of an inch in thickness, such brass being tinned. Although I prefer brass, I do not confine myself to that metal, but intend to avail myself of other metals, or compounds of metals, suitable for the purpose, care being observed that in whatever metal chosen for the purpose of making such wadding, that its hardness shall be such that the ordinary worm or screw on the ramrod shall readily pass through when it is desired to withdraw the charge; and it is desirable, that whatever metal is used, that it should possess a degree of elasticity, that the disc or wadding being formed in the slightest degree larger than the bore, it shall, by pressing against the sides of the barrel, offer sufficient resistance to retain it securely to the place to which it is rammed: and it will be desirable further to remark, that lead should not be used, owing to its want of such degree of elasticity, but more particularly as it would add to that prejudicial effect usually produced by the shot in discharging a fowling-piece, termed "leading," and which my improved wadding has a tendency to remove.

Having now described the nature of my invention and the manner of carrying the same into effect, I would have it understood, that I do hereby expressly confine my claim of invention to the application of metallic discs (having suitable apertures for the passage of air) to the purpose of wadding for fowling pieces, and such like fire-arms, as above described.—In witness whereof, &c.

Enrolled August 22, 1834.

HAYS' EASY CHAIR.—It is a common mode of expression, when we are about to refer to or speak of a new invention, to say, "we have before us," &c., but in this case a departure from the usual mode of expression is necessary, as we have *beneath* us one of Mr. B. F. Hays' easy chairs, invented for the comfort and convenience of invalids. It is, indeed, an *easy* chair; but may, with very little trouble, be converted into a bed, or a

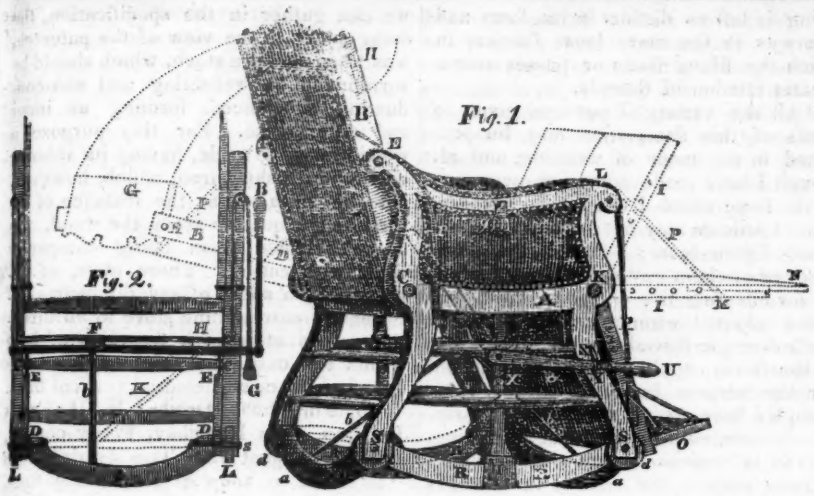


Fig. 1.

Fig. 2.

cradle, having two sets of rockers, one for the chair, and one for the bed or cradle—or they may, if desired, in order to effect a change of position, be thrown into gear, and used on the chair, in the same manner as when it is used as a cradle. It has also a set of rollers, by which it may be moved to any part of the room without incommoding the invalid. There are also conveniences for accommodating a lame limb—which may be supported and sustained at any desired angle, from a horizontal to vertical position.

There are other and peculiar conveniences about this chair, which can only properly be understood by examining it, which may be done at any time by calling at the office of the Mechanics' Magazine, or the New-York Farmer.

The annexed engraving and references will give something of an idea of it; but nothing short of an actual enjoyment of its comforts, can give a correct idea of its merits.

Fig. 1, *Angling view of Chair.* A, frame work of suitable strength and dimensions; B, back, turning on pivot C, made fast at any angle by a strap and buckle, as D and E; F, head-piece, turned up on pivot H for head-boards, as G; I, foot-pieces, made in two parts, either of which raised on the pivot K to any angle, and fastened by strap and buckle, as at L M; N, sliding pannels, drawn out for a bed; O, foot-board, raised or lowered at pleasure; P, strap, holding back and foot pieces; R, side rockers, with a joint at T, and sliding socket; S, pivots for rockers; V, friction rollers, moving in a sliding mortice at the end of rockers in joint; U, lever, fixed to an arbor, short arms meet the socket in pitman T, making a joint at X; Y, fastening for lever, which being firmly and carefully raised into the position defined by the dotted lines, the side rockers are drawn up, leaving the chair resting upon the cross or cradle rockers, *a*; *bb*, rods, confining cross rockers to sliding bar; *g*, strap passing on rollers, moving the sliding bar back and forth on the arbor, folding the cross rockers into a horizontal, or pressing them out into a perpendicular position, while the chair rests on side rockers; *d*, rollers.

Fig. 2, *showing a Sectional View crosswise.* A, arbor; B, lever; C, short arm of lever joined to arbor at X, and making a joint at socket or pitman at E; D, end of side rocker; F, end of sliding bar; G, straps, by drawing which the bar is moved on the arbor to H; *b*, rods, folding in the cross rockers to a horizontal position, (turning on the pivot S,) and lying on the angle K; L, edge of rollers.

The whole is plain and simple in its construction, fitted for all the purposes of the nursery and parlor, adapted to all classes of invalids, easily changed into a great variety of positions to suit dropsical, asthmatic, and rheumatic patients—cheap, and of convenient size, light and portable, easily conveyed from one apartment or place to another. It is well calculated for journeying with weak and feeble persons, affording a comfortable bed, when needed by the way; well calculated for a hospital, surgeon's, or dentist's chair, and not less adapted for all the ordinary purposes of a common rocking chair, or a single bed, in a private family or public office.

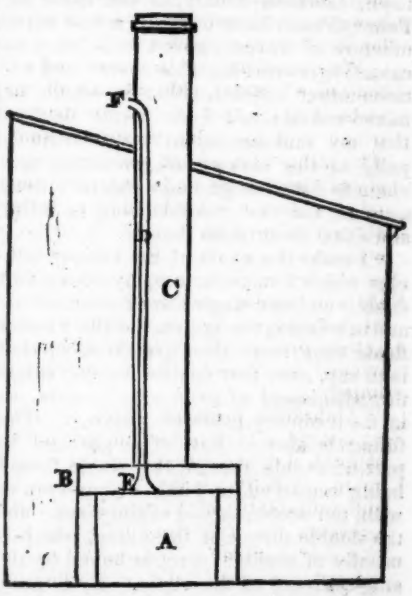
[From the N. Y. Mechanics' Magazine.]

Smoky Chimneys.

An article in a late number of your journal recals to my mind a plan of curing smoky chimneys, which I saw practised in Paris when I was a student of medicine there, about twenty years since. As this plan succeeded entirely in the case referred to, and as it is not known or practised, so far as I can learn, in this country, and as, moreover, it is applicable to the worst conditions of chimneys, for carrying smoke well, I mean those of low buildings, adjoining or surrounded by such as are higher, I am of opinion that it may be adopted with great advantage.

The room which I occupied was on the ground floor of a two story building, on one side of an enclosed square, of which the three other sides were occupied by high buildings. The fireplace was large and open. I had it contracted a la Rumford. Still the smoke poured down in such volumes as to render it impossible for me to keep a fire, and I was about abandoning my quarters, for which I had paid a three months' advance of rent, when, at the suggestion of the porter, I sent for a chimney doctor. He brought with him two pails full of plaster of Paris, a hammer, and a cylinder of wood about eighteen inches long, and two or three inches in diameter. I say cylinder: it was, more strictly speaking, a truncated cone, the diameter of one end being a little smaller than the other.

The doctor went up the chimney, and with his hammer made a hole through one side of the chimney, just above the roof. This hole was about large enough for a man's arm to enter. Now, placing the stick or cylinder, which he had greased, inside of the chimney, from opposite to the hole downwards, he called for some tempered plaister; he formed around the cylinder a pipe opening downwards. By successive formations, he continued this pipe down to the lower part of the chimney breast, where it terminated with a flattened opening. This he called a ventouse, or blower.



A, chimney, or section of fireplace.
B, chimney breast.
C, chimney.
D, the ventouse, or blower.
E, the lower flattened end of the blower.
F, the upper end of the blower, where it admits the external air.

The operation of this contrivance, for which a tin or copper leader might be substituted, will be evident to any one acquainted with the subject. The air within the cavity of the chimney being rarified heat, has a tendency to rise in it, and so has the smoke, which is specifically lighter. This tendency may be resisted by several causes. The chimney throat

may not be large enough to let *all* the smoke ascend and pass out. It may be too large; if so, the cold air will enter at the top of the chimney, and, descending, will mix with and cool the smoke and heated air arising from the fire; thus causing a circulation within the chimney. This is a very frequent cause of smoky chimneys. A third cause is an insufficient supply of external air through the doors and windows; hence, some of the supply comes down the chimney. A fourth cause is a draught of air from the room to another room or fireplace, causing a similar descent. The plan I have described is calculated to remedy smoky chimneys from any and all these causes. The air descends through the blower, and supplies a sufficiency for the draught of the chimney. If it is in excess, it enters and cools the room. I am, &c. &c.

MEDICUS.

[From the Journal of the Franklin Institute.]

***American Patents issued in August*, 1834.**

(Continued from page 22.)

7. For a New Manufacture of Figured Fabrics; John Smith, Shaeffers-town, Lebanon county, Pennsylvania, August 4.

[A part of the following specification having been omitted in our last number, we now give it entire.]

"To all whom it may concern, be it known, that I, John Smith, of Shaeffers-town, Lebanon county, in the State of Pennsylvania, have invented a new manufacture of woven figured stuffs, such as carpeting, coverlids, table covers, and various other articles, either in single or mixed colors; and I do hereby declare that my said invention consists principally in the manner of preparing the chain to form the ground or basis of such articles, and that the following is a full and exact description thereof.

"I make the chain of the various articles which I manufacture, by taking two double and one single thread alternately; and in weaving the figures, the filling never floats over more than five threads; that is to say, over four double and one single thread, instead of over nine threads, as in the ordinary mode of weaving. The filling is also in part of single and in part of double thread, the single thread being employed to bind, or interweave with, the double thread of the chain; and the double thread of the filling, which is usually of woollen yarn, is bound by the single thread of the chain. By forming my patterns in this way, no part of the fabric is loose from, but is interlocked with, the pattern on the opposite side of the cloth, and a degree of firmness and distinctness of pattern is given, which cannot be attained by the use of a chain composed entirely either of double or of single threads, whilst, at the same time, each thread of the filling interweaving with one of the chain, at shorter intervals than in the ordinary mode of weaving, the article is rendered more durable, and the double thread of the filling being bound down by the single thread of the chain, the pattern formed by the double filling is left as distinct in its form and colors as in the more loose fabrics, in which the filling floats or passes over a greater number of threads.

"All the variety of patterns given to goods of this description may be produced in my mode of weaving, and although I have made some improvements in the loom which I use for the purpose, similar articles may be woven in the ordinary figure loom; I do not, therefore, describe or claim any particular machinery for effecting the object in view, but claim only the arrangement of the double and single threads in the chain, and in the filling, applied in the manner and for the purpose herein described. Although I have spoken of double and single threads, both in the chain and filling, it is to be understood that these denominations respect the size of the threads employed, rather than the mere fact of their being double, or single, as a double yarn may be employed in lieu of that which I denominate single, provided its fineness was such as to produce the intended effect, and a fine double yarn thus used I should consider as interfering with my invention, as it would enable the weaver to produce a manufactured article essentially similar to that described."

19. For a Churn; Joshua Ricker, Bangor, Penobscot county, Maine, August 9.

20. For a Composition of Matter applicable to the Construction of Roads, Streets, &c.; John Martineau, Elbridge, Onondaga county, New-York, August 11. The claim at the close of the specification of this patent will exhibit clearly the object for which it is obtained.

"What I claim as my invention and improvement, is the application of tar, turpentine, or any other of that class of cohesive substances, reduced before use to a fluid state, and in that state used as a cement to apply to, and combine with, sand, gravel, pebbles, pulverized stone, such as is used for a M'Adamized road, or cobble stones; the interstices of coarse materials being in all cases filled, as well as may be, with sand and gravel, and cemented with tar, or turpentine, to form the wearing surface of roads, streets, &c., in the manner described in this specification, however the same may be modified or varied in practice. I also claim the application of the before mentioned cohesive substances, combined with sand, or other material, to the lining of canals, raceways, flooms, reservoirs, cisterns, &c. &c. in all the varied forms which practice may suggest, however modified or varied."

21. For Hulling Clover Seed; Benjamin Wood, Doylestown, Bucks county, Pennsylvania, August 11. The clover is fed on to a sloping sifter, by the shaking of which it is to be separated from the straw; this sifter has a tight bottom, and above this a false one, which is perforated with holes sufficiently large to admit the seed to pass through.

22. For a Heat Retaining Cooking Stove; John Moffit, Buffalo, Erie county, New-York, August 13. From what we can gather in the specification, the main object, in the view of the patentee, was to construct a stove, which should be surrounded by reflecting and non-conducting substances, forming an inner and outer case. For this purpose a wooden case is made, having its interior covered with sheet iron, which, however, is to be sustained at the distance of an inch and a quarter from the wood, the space between them being compactly filled with cotton. There must, of necessity, be a space of several inches between the case and the stove in all directions. To allow of a free play of heat within the case, the sides of the stove are, in part, constructed of vertical bars.

23. For a Fly Driver; R. H. Faunt Le Roy, New-Harmony, Posey county, Indiana, August 13. The fly driver is "intended to keep or scare away flies, moschettoes, and other insects, from beds, cradles, tables, and other places where said insects are troublesome, by means of fans, wings, brushes, curtains, or feathers, kept in motion by means of a machine, without the attention of any person."

24. For an improvement in Fire Proof Wrought Iron Chests, and in locks and fixtures therefor. First patented March 7th, 1826; patent surrendered and re-issued on an amended specification, August 13.

25. For a Press Tub, for pressing seeds, kernels, &c.; Francis Follett, Petersburg, Virginia, August 14. The principal improvement claimed in this patent is the mode in which the strainer is made that forms the bottom of the tub.

26. For a Cooking and Heating Stove; Samuel B. Sexton, Philadelphia, Aug. 14.

27. For an improvement in forming Bodies for Hats; William Nunns, city of New-York, August 14. Hair cloth, formed of horse, or other hair suitable for the purpose, and combined, if desired, with other filamentous substances, is to be formed into a body, and stiffened by any of the ordinary methods. The body so formed is intended principally as a foundation for silk hats, but it may be used with other material, or by itself, which use the patentee would consider as a part of the present invention.

28. For a Horse Power; John A. Pitts, and Hiram A. Pitts, the former of Brinthrop, Kennebeck county, the latter of Livermore, Oxford county, Maine, August 15. The improvement in the horse power claimed by the patentees, they denominate an "Endless chain and cog band."

29. For a machine for Doubling, Twisting, and Laying, Spun Tobacco; James Maurey, Petersburg, Virginia, August 15. This machine resembles, in its general construction, some of those used for doubling and twisting cordage, but so altered as to adapt it to perform the same operation upon tobacco, and thus to facilitate, in an important degree, the manufacture of twist.

30. For an improved Oven; Richard R. Tonge, Fryeburg, Oxford county, Maine, August 15.

31. For a Machine for Hatchelling

It is said, however, not to stand in the furnace for smelting iron.

Hemp, Flax, and Woof; Daniel Treadwell, Boston, Massachusetts, August 18.

32. For machinery for Tarring Rope-yarns; Daniel Treadwell, Boston, Massachusetts, August 18. The patentee states that his improvement consists in three distinct parts. First, in the method of heating the tar; second, in rubbing, or untwisting, the yarn, for the purpose of saturating it with tar; and third, in the nippers for pressing out the superabundant tar.

33. For an improvement in the art of Extracting the Precious Metals from their Ores; John L. Sullivan, city of New-York, August 18. It is our intention to give a full description of the apparatus which forms the subject of this patent; but knowing that the patentee intends to introduce further improvements in the mode of procedure pointed out by him in his specification, we will at present merely observe, that by the machinery employed, the ores of gold, and more especially auriferous iron pyrites, are to be exposed, when pulverised, to the united influence of heat and motion; the heat being principally supplied by a current of air, which will carry off the sulphur and other volatile matters, and thus leave the gold in a proper state to be separated from the ore by amalgamation, either in the same, or in an auxiliary instrument.

34. For a Threshing Machine; Isaac Gallop, Plainfield, Windham county, Connecticut, August 18.

35. For an improvement in Fire Ladders; James Lee Hannah, M. D., city of New-York, August 19. A ladder is to be made in the usual way, but having the two sides parallel to each other. The topmost round is to be a bar of iron, which is to project through the cheeks of the ladder, and is to have a round roller, or wheel, at each end, which, by their rolling upon the wall, are to facilitate the raising of it. The main ladder may be forty feet in length; but there are to be additional sections, each of from five to eight feet long, to be fastened on its bottom, when necessary; strong bolts at one end of these sectional pieces are to pass thro' staples at the lower end of the ladder.

36. For an improvement in instruments for Cutting and Crumbling the Stone in the Bladder; James Lee Hannah, M. D., city of New-York, August 19. These instruments for cutting and for crushing the stone, are, when closed, in the form of a sound or catheter, but considerably curved at the end which is to enter the bladder. According to the drawing, the shaft is straight, but the end is bent round so as to form a quarter of a circle of about three fourths of an inch radius. This quadrant constitutes the jaws by which the cutting and crushing are to be effected; these jaws work on a pin near the extreme end, and when closed form a round smooth body, having no projection to obstruct it in its entrance; its opening commences at the point where the curve terminates and joins the straight shaft. This straight shaft consists exteriorly of a thin silver tube, and through this tube passes a steel spring like a watch spring, which, when pushed in, allows the jaws to open, the spring being attached to the jointed piece. The cutting instrument has edges like shears, the crusher opens like forceps, and has teeth to hold and crush the particles of stone which have been divided by the cutter.

37. For a Machine for Grinding Grain; Joseph Grant, Providence, county of Providence, Rhode Island, August 19. This is to be a cast iron mill, consisting of three cylinders and a concave, all of which are to be so fluted as to form teeth not more than a quarter of an inch wide, and an eighth of an inch deep. Two of the cylinders, with a hopper above them, are to be placed horizontally and parallel to each other. The lower cylinder has a concave under it, which is adjustable by means of a screw. The cylinders are all to move with different velocities, the last with the greatest speed.

38. For a Threshing Machine; Chas. Wilson, city of New-York, August 19. This machine is to have a frame made entirely of cast iron, and the concave is to be formed entirely of triangular cast iron bars, about five eighths of an inch thick, and an inch apart, allowing space for the grain to fall through between them. The whole surface of the cylinder is also to be of cast iron, consisting of bands or hoops, four or five inches wide, and a quarter of an inch thick, with projecting pieces for beaters cast on them. These bands are to be driven on to a wooden cylinder.

39. For an improvement in the Percussion Cannon Lock; Enoch Hidden, city of New-York, August 20.

40. For a Filtering Machine; Isaac Wiseman, city of New-York, an alien, who has resided two years in the United States, August 20. The principal difference between this and the filtering vessels ordinarily employed, consists, first in there being a separate vessel to receive the water which has been filtered, and which vessel can, therefore, be removed for the purpose of clearing it of the sediment which always finds its way into such reservoirs; and, secondly, in interposing between the layers of broken quartz, sand, charcoal, &c., perforated plates of earthen ware, metal, or other substances, which will prevent their mixing with each other from agitation in removal from place to place. Such perforated plates are not new.

41. For a Revolving Turning Steel; Benjamin E. Hoyt, Ipswich, Essex county, Massachusetts, August 20. This steel is for turning the edges of curriers', or other knives, by passing a roller instead of a burnisher over them.

42. For an improvement in the manufacture of Percussion Powder; Samuel Guthrie, Sacket's Harbor, Jefferson county, New-York, August 21.

43. For a machine for Separating Gold from the Soil; John Dobson, Burke county, North Carolina, August 21. This machine has an inclined rocker, similar to that used in many others, and various appendages which have no claim to novelty. After describing these, the patentee says: "although I have been particular in describing the construction of the above machine, yet I rest my claim only on those principles of the bucket or receiver, by which a peculiar rolling motion is given to the mercury, most applicable to the collection of the gold; which principles and advantages it may be necessary to mention as understood by me. In the first place, a larger quantity of mercury can be used than by the present mode, without danger of loss, and extending from side to side of the bucket, presenting a rolling edge to the approach of the gold, of sixteen inches in length.

44. For a Clover and Herdgrass Hulling Machine; Reuben Ranger, Wilton, Kennebeck county, Maine, August 21. The hulling is to be effected by rubbing the seeds between perforated plates of sheet iron, one portion of which is a conical body, and is made to revolve upon a shaft placed horizontally; this is surrounded by a concave similar in form, and surmounted by a hopper. The rubbed seeds pass out through an opening in one end of the machine, at the lower edge of the base of the cone.

45. For an improvement in Finishing Leghorn, Straw, Grass, and Palm Leaf Hats and Bonnets; Joseph Snyder, city of Philadelphia, August 22. The hats and bonnets are to be varnished with any of the known suitable varnishes, adapted to the color of the article.

"The object intended to be attained by the foregoing improvement is to preserve hats and bonnets from moisture, that they may retain their proper shape."

46. For an improvement in the Spinning of Rope and other Yarn; Sidney D. Whitlock, Brooklyn, Kings county, New-York, August 22. It is observed in the petition, that this patent is claimed for a "new application of the machine for which letters patent of the United States were granted to a certain Robert Graves of Boston, on the first day of April, 1819."

In the specification it is stated, that the original machine is modified by the use of a double railway for the machine, or machines, to run upon; using at each end of the double track, a detached section of the track, made to revolve like the turn-abouts upon railroads, so as to accommodate the equalizing machine. "Each track is furnished with an endless band and rope, operating as described in the specification of the said Graves' machine herein referred to, alternately on the equalizing machines as they change tracks."

47. For an improvement in Shearing Machines for Shearing Woollen Cloth; Reuben Daniels, Woodstock, Windham county, Vermont. First patented May 13th, 1834. Patent surrendered and reissued on an amended specification, August 22.

48. For improvements in the Power Printing Press; Otis Tufts, Boston, Massachusetts, August 22. We are informed in this specification, that "the principal difference between this power press and

others now in use consists in supplying it with paper to be printed from one side of the frame, by using two friskets, one of which is under the operation of an impression from the platten, while the sheet of paper last printed is being removed from the second frisket, and another sheet is applied. As soon as the frisket first mentioned has received an imprint from the types, it is withdrawn by the operation of the machinery from between the platten and form, and the second frisket caused to pass in between the platten and frame, there to be acted on in its turn. So in succession each passes out from between the platten and frame with its printed sheet, while the other, with the sheet to be printed, is made to pass in between the platten and frame."

49. For a Double Cylinder Truck, for Raising Stone, Timber, &c.; Simon Frieze, Waterloo, Anne Arundel county, Maryland, August 23.

This truck is to run up an inclined plane or railway formed of parallel timbers, rising at any angle not exceeding thirty degrees. Instead of four wheels, there are to be two rollers turning on gudgeons, one at each end of the truck. An offset is to be turned down at each end of the rollers, to form a shoulder, or flanch, to keep them in their places on the ways. The part turned down is to be champhered, to cause the truck to keep the track the more readily. At the upper end of the inclined plane there is to be a block with a rope passing over its sheave, one end of which rope is attached to the truck, and the other drawn by horses or other animals, to raise the load.

50. For a Machine for Hulling Clover and other small Seeds; Merit Baily, Attleborough, Bucks county, Pennsylvania, August 23.

51. For a Horse Power; Joseph B. Streeter, Middlesex, Yates county, New-York, August 26.

52. For Jointing and Manufacturing Staves for Barrels, &c.; Cyrus M'Gregor, Newport, Sullivan county, New-Hampshire, August 26.

53. For an improvement in the surgical instrument called a Scarificator; Geo. Tiemann, city of New-York, August 26. The improvement in the construction of the scarificator, which forms the subject of this patent, appears to us to deserve the appellation, as we think that, both in construction and in operation, it will be found superior to those made either in the English or the German manner. The patentee, after describing the usual mode of forming this instrument, informs us, that the principal improvements made by him are the use of pointed lancets, instead of those with rounded ends; a contrivance for using them with more exactness, and so as to cause less pain, and produce a more profuse bleeding than heretofore, whilst the mechanism is more compact, and more easily kept clean, and in order, than in the old instrument.

The lancets, instead of standing in rows upon an axis, or shaft, are all fixed upon a flat plate, which fits into a box, similar to those now in use, but smaller. For the purpose of moving the plates containing the lancets, an axis and jointed levers are placed under it, which are operated upon by suitable springs, and other appendages, that are fully described, and perfectly represented in the drawing. There is no distinct claim made, but the difference between this and other instruments for the same purpose is clearly designated, so as to leave no doubt whatever respecting the points upon which the dependence for originality is placed.

54. For Stoves for Burning Coal; Abial Smith, North Providence, Providence county, Rhode Island, August 27.

55. For a Threshing Machine; John Matthias, Manchester, Baltimore county, Maryland, August 27.

56. For a Bedstead for the Sick; Wm. Woolley, city of New-York, August 30. [For a description, with drawings, see p. 74, vol. iv., of Mechanics' Magazine.]

List of American Patents which issued in September, 1834.

1. For a Perpetual Shoe Bench; Samuel Haynes, Malden, Middlesex county, Massachusetts, September 1.

2. For an improvement in navigation, called the Cylinder Boat; Amos Kendall, city of Washington, District of Columbia, September 2.

3. For a Thrashing Machine; Israel Lukens, Upper Dublin, Montgomery county, Pennsylvania, September 2.

4. For an improvement in the application of steam to the purpose of cooking, called the Steam Baker; Charles F. Wilcox, Springfield, Hampden county, Massachusetts, September 3.

5. For machinery for Cutting Crackers; Lucius Kirtland, New Haven, New Haven county, Connecticut, September 4.

6. For an improved press, for Pressing Cheese; Elijah Barnes, North Brookfield, Worcester county, Massachusetts, September 5.

7. For a machine for Hulling Barley; Henry Handschey, Bridgeville, Muskingum county, Ohio, September 5.

8. For Wheels for Carriages, &c.; Barney Ruggles, Warsaw, Genesee county, New-York, September 8.

9. For a Shoe for Mill Cans; James Dennis, Providence, Rhode Island, September 8.

10. For a Circular Saw Mill; John Penman, Charlotte, Muhlenburg county, North Carolina, September 9.

11. For Lessening Friction, by friction rollers; Isaac Clowes, Norfolk, Norfolk county, Virginia, September 9.

12. For improvements in Locomotive Engines and Cars, for Railroads; Matthias W. Baldwin, Engineer, Philadelphia, September 10.

13. For a Brick Machine; Cyrus Chaney, North Prospect, Waldo county, Maine, September 11.

14. For a Stove; James Wilson, city of New-York, September 12.

15. For an improvement in the Horse Collar Block; Dyer Cleaveland, Owego, Tioga county, New-York, September 13.

16. For a Relief Bedstead, for the use of invalids; David Anthony, Adams, Berkshire county, Massachusetts, September 13.

17. For a new Material for Stuffing Mattresses; Elias Howe, Cambridge, Middlesex county, Massachusetts, September 13.

18. For an improvement in the construction of Water Cisterns; Obadiah Parker, Syracuse, Onondaga county, New-York, September 15.

19. For an improved Re-action Water Wheel; John L. St. John, Canajoharie, Montgomery county, New-York, September 16.

20. For a Handling Machine, to be used in the manufacturing of Leather; William G. Waterman, Sullivan, Madison county, New-York, September 16.

21. For an improvement in the form and construction of Gridirons; Fenner Bush, and Linus Pratt, Meriden, New-Haven county, Connecticut. First patented July 21st, 1832. Patent surrendered, and re-issued upon an amended specification, September 17.

22. For a Straw Cutter; Nimrod Murphrie, Nashville, Davidson county, Tennessee, September 17.

23. For Sun Dials of Cast Iron; Heman M'Cluer, Hamburg, Erie county, New-York, September 17.

24. For a Horse Power; Sewall Gleason, Westville, Franklin county, New-York, September 18.

25. For a Rotary Steam Engine; William Sutton, Geneva, Ontario county, New-York, September 18.

26. For a Churn; Adna L. Norcross, Hallowell, Kennebec county, Maine, September 19.

27. For Shears for Cutting Metal; George Christian, Mentz, Cayuga county, New-York, September 20.

28. For an improvement in the Forcing Pump; James D. Egbert, Lansing, Tompkins county, New-York, September 22.

29. For a Horse Power; Silvanus Leonard, Hampton, Penobscot county, Maine, September 23.

30. For an improvement in the Cast Iron Fireplace; Ansel Hayward, Easton, Bristol county, Massachusetts, September 25.

31. For an improvement in the Dress of Mill Stones; Isaac W. Elmore, Lyons, Wayne county, New-York, September 25.

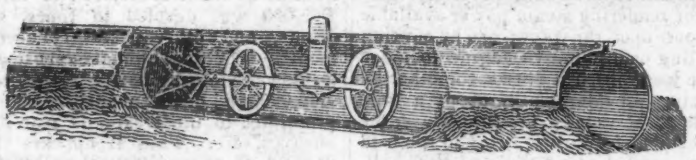
32. For a machine for Thrashing and Cleaning Grain, and for Shelling Corn; David Knauer, East Nantmeal, Chester county, Pennsylvania, September 25.

33. For a Centripetal Power Press; Eliphalet S. Scripture, Cazenovia, Madison county, New-York, September 26. [See page 157, vol. viii., of the New-York Farmer.]

34. For Water Wheels; Garet H. Heermance, Coxsackie, Greene county, New-York, September 30.

35. For an improvement in Stoves for Burning Anthracite; William A. Hopkins, city of New-York, September 30.

36. For a Tin Baker; Josiah St. John, Hudson, Columbia county, New-York, September 30.



The first figure represents a Pneumatic Railway in operation, with trains on a double track, approaching each other, one having just passed a stationary engine. ☞ This was designed to represent two trains passing a station, but by mistake the station was misplaced by the engraver.

The second figure represents a sectional view of the railway cylinder, showing the internal arrangement.

PNEUMATIC RAILWAYS.—We have been favored by a friend in London with the following communication on a new, called *Pneumatic*, system of railways. It must, we think, be considered as one of the *visions* of the day; yet that is no affair of ours, as we aim to give our readers an account of whatever pertains to the subject of internal improvements, be it ever so visionary—if we imagine that any new idea may be gained from it which will, or may, benefit the great cause; and it is for the purpose of eliciting discussion that we lay this communication, and the opinion of Dr. Lardner and Faraday, before our readers.

That the adoption of railroads as the means of inland transit has become a subject of deep interest to the community, and that their vast advantages are duly appreciated, is evinced not only by the ready support which is given by the public to the spirited efforts now making for their extensive application, but also by the sanction which has been accorded them by the Legislature. Indeed, at the present moment, an almost incalculable amount of capital is actually pledged to the institution of a general system of railway throughout the kingdom.

But notwithstanding the admitted advantages of railroads, as at present constructed, worked as they are by the locomotive steam engine, over the old system of transit, that splendid experiment, the Liverpool and Manchester line itself,—to the projectors and managers of which the nation is so greatly indebted for the stimulus it has given to improvements in inland transit and consequent benefit to commerce, the extent of which, indeed, are not yet fully developed,—has at the same time disclosed the inefficiency of the construction by its utter inability to withstand the violent action and tremendous concussions of the ponderous engine, which is also destroyed by its own force, and the imperfections of the locomotive system by the incompetency of the engine to work with advantage except upon a level. Hence the wear and tear of the railways in that line has amounted to not less than £500 per mile per annum, whilst the locomotive engines, of which not less than thirty* are employed upon the road, besides nearly half that number more which come upon it from branch lines, are worked and maintained at the enormous cost of more than £2,000 per annum each.

The immense expenditure of capital required in the formation and construction of the common railroad, owing in a great measure to the necessity of obtaining a nearly perfect level, and the great cost of maintaining and working the ways when they are formed, will necessarily induce the public readily to adopt any improvement which shall have the effect of increasing the *stability of the railway at a diminished cost;* and especially if it combine with it greater *security, efficiency, and economy* in the working.

The invention, which is the basis of the improvement now submitted to the public, consists in the means of applying the elastic and forcing power of the atmosphere, obtained by rarefaction within a hollow cylinder of from thirty to forty inches in diameter, to carriages and cars *running upon rails on its outer surface;* the action being produced and transferred by means of pneumatic machinery worked by sufficiently powerful fixed or local steam engines.

Steam power, used as a first mover, admits of no application so economical as that by means of fixed engines;† and thus motive power will be obtained at one quarter the expense of that yielded by the locomotive engine. The fixed engine gives also the advantage which the locomotive does not possess, that the intensity of its force can be greatly varied to suit the exigencies of the road, and thus it may be rendered available according to the nature of the slope, or steepness of the acclivity to be overcome, the weight to be moved, and the degree of rapidity required. Unlike that of the locomotive engine, the power of the fixed engine is, *by the improved system,* communicated with no indirect expenditure to the load or train of carriages; whilst the power of the locomotive is first applied to bear along its own ponderous bulk, which is of about ten tons weight, or fully one fourth of its usual load, and, as before remarked, it destroys both railway and engine by its violent action and concussive force.

The power of surmounting acclivities renders the most direct lines of communication available, and thus shortens the distances between places, and avoids the necessity of circuitous routes in search of levels. Moreover, the improved system of railway permits of roads being laid through a marsh as well as over a common or down, and with no greater expense, thus affording the means, in many cases, of avoiding the annoyance, inconvenience, and expense, of running roads through parks, and over arable lands. It may be remarked, too, that the great expense involved in the formation and construction of a railroad upon the common system, is totally sunk in cutting down or in tunnelling through hills, and in building across or embanking over valleys; whereas the main expense involved in the formation of a road on the improved system, is in common iron castings, which being almost indestructible, and possessing an intrinsic value, little or no loss can accrue upon them.

Not only does the improved system present a firmer construction of the railway, and a highly economical application of power, but it affords also greater protection to life and property, in the security of the carriages and cars for the conveyance of passengers and goods, since these are so placed upon the rails, and so connected with the railway itself, that they cannot by any possibility be thrown off or overturned. In consequence of this advantage, whatever objection may exist in the public mind to travelling upon railways, because of the danger connected with the common system, will be entirely removed, and a great improvement may be confidently calculated upon in the important item of passenger traffic.

When it is considered that, *by the improved system, a line of road may be formed and constructed for, at the most, two-thirds, and in some cases for one half, the expense involved by the common system,* and that *such a railway can be maintained and worked with far greater speed, and infinitely greater safety, for three-fourths less than the common system costs,* and that therefore *passengers and goods may be conveyed at one half the price which the common system demands, and then yield a far greater profit,* competition with the Association will be wholly out of the question.

As any degree of speed can be ob,

* This number, at least, is possessed by the Company, though not more than half of them are at any time in working condition; the other half are always in hospital to be repaired.

† A fixed steam engine will last twenty-five years, and the deterioration will not be more than 1½ per cent. per annum.

tained by the improved system, with the most perfect safety, and without the disadvantage, not to say danger, arising from great velocity on the common method, a single line, on the new system, can be made, by the reciprocating plan proposed, to effect as much transit as can be effected by the use of a double line on the former, while the cost will thereby be lessened nearly one half. Hence, communications that may not warrant the expense of a double line of railway, may be advantageously occupied with a single line; numberless lines are in this manner open to the application of the new system, which the common method will not permit of being attempted.

As the invention affords the means of applying the power to the common railway, the proprietors of such must soon be found anxious to avail themselves of its advantages; and thus all the railroads in the country may soon become tributary to the Association, while the interests of the various concerns themselves will be materially improved by the adoption of the improvement.

As many millions are actually invested in this country in canals, and that species of property may be much deteriorated by the general application of railways, unless this improvement which affords them the means of increased speed is adopted by the respective canal proprietaries, the Association may fairly calculate upon rendering all these interests likewise tributary, in exchange for the advantages to be derived from the licence to apply their improved system.

In addition to affording the means of transit upon railways, whether upon the improved or with the common system, the power may in like manner be applied to *effect rapid transit, with great economy,* upon canals.

The practicability of the improvement, and the efficiency of the application, are proved by experimental operation, and confirmed by the opinion of the most eminent scientific men in the kingdom.

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Opinions of Prof. Faraday and Dr. Lardner upon the Pneumatic System of Railway.

Royal Institution, 3d Feb., 1835.

My dear Sir,—The points in your letter of the 26th of last month, which you put to me for an opinion, are such that I have no hesitation in agreeing with you upon them.

To enumerate briefly these points:—the *principle* of communication of power is correct; the use of local steam engines is highly advantageous, both for cheapness of force and capability of varying it when required; the necessity for levels will, I presume, therefore be greatly obviated; the association of cylinder and rails is such, that the whole road must (with sufficient thickness in the cylinder) have great strength and firmness; the absence of locomotive engines removes much of the cause of derangement which the road would have to sustain; and I do not see how the governor and carriages can leave the railway.

You know my objection to giving a general opinion in reference to the profitable application of the plan in question; but I may here add, that the reserve I feel originates simply in my possessing no practical knowledge of the construction, expense, and profit, of ordinary railroads.

I am, my dear Sir, very truly yours,
M. FARADAY.

Wm. Hosking, Esq., F. S. A., &c.

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I have read the specification of the patent for the pneumatic railway and the accompanying papers, and have also examined the drawings and models which have been submitted to me by Mr. Hosking.

Two methods have been heretofore employed for rendering steam power available in transport upon railways; one by causing a travelling or locomotive engine to move with the load which it draws, the other by constructing, at intervals of about a mile and a half, stationary steam engines, the power of which is transmitted to the load by a rope carried along the road upon rollers or sheaves placed between the rails. The train being attached to this rope, is drawn by the power of the engines from station to station. The object of the pneumatic railway is to substitute for the rope a partially-exhausted tunnel; to employ the fixed steam engines to work air-pumps, by which a rarefaction of the tunnel shall be maintained; and to cause the trains to be tracked upon the railway by connecting them with a diaphragm or piston placed in the interior of the tunnel, so as to have that part of the tunnel in advance of the piston rarefied by the engines, while that part behind the piston is open to the atmosphere. An effective impelling power is thus obtained equivalent to the difference between the pressure of the atmosphere on one side of the diaphragm and of the rarefied air on the other.

Of the practicability of this project I think there can be no doubt. The working of large air-pumps by an adequate moving power, and the rarefaction of air in tubes or tunnels by such means, is not a new idea. It was suggested by Papin, in the latter end of the seventeenth century, and was even pointed out by him as a means of transferring power to a distance, without the loss by friction and other causes consequent upon the use of ropes or other ordinary means of transmitting force.* It is, in fact, a well understood principle in physics, that whatever moving force be expended in producing the rarefaction of air in a cylinder or tunnel, must necessarily be followed by a corresponding force on the other side of a diaphragm moving air-tight in that tunnel, and exposed to the free action of the atmospheric pressure. In the present case, supposing the structure of the valvular cord and the pneumatic piston to be perfect, the opposite side of the diaphragm will always be pressed by an effective impelling force, the amount of which may be calculated upon these principles. It will of course be perceived that no original moving power is obtained from the tunnel, or from the rarefied air; the rarefaction gives back the power expended by the stationary engines and nothing more; and the tunnel must therefore be regarded merely as a substitute for the ropes in the common method of working railways by stationary engines. But it is evidently attended with several advantages in comparison with the latter. A very large proportion of the moving power of stationary engines worked by ropes is intercepted by the resistance from the weight and friction of the ropes, sheaves, barrels, drums, &c. All such waste of power is removed by the pneumatic tunnel.

* Papin proposed to obtain an active force at one end of an extended tube by the application of water power at the other.—W. H.

The original expense of ropes and their wear and tear would be likewise saved. Some notion of the extent of this saving may be collected from the following facts: when the Liverpool and Manchester railway was about to be brought into operation, a question arose as to the expediency of working it by stationary engines, and estimates of the expense were made by competent engineers. The total amount of capital to be invested in moving power was estimated at about £120,000; of this above £25,000 was devoted to ropes, sheaves, drums, and other necessary accompaniments. The total annual expense of maintaining the moving power was estimated at £42,000, and of this about £18,000 was appropriated to the wear and tear of ropes, sheaves, &c. Thus it appears that the method of transmitting the power of the stationary engines to the trains by ropes would absorb about 20 per cent. of the invested capital, and their maintenance would consume about 43 per cent. of the annual expenditure.

Another source of comparative economy would obviously be the diminished number of stationary engines. In the estimate already referred to, it was calculated that the distance of 30 miles should be divided into 17 stations, with two 40 horse engines at each station; besides these there would have been two engines at the bottom of each inclined plane, one at the tunnel, two at the top of the planes, and one at the Manchester end, making in all 42 stationary engines to work a line of 30 miles. Now, according to the estimate of the patentee of the pneumatic railway, from three to six stations would be sufficient between Manchester and Liverpool, and the whole line would be worked by from six to twelve steam engines. Putting aside therefore the saving of power which would arise from the substitution of suction in the tunnel for ropes, and supposing the amount of stationary power in both cases to be the same, it will be evident that a material saving would arise from the circumstance of that amount of power being derived from so much less a number of engines,—the number of enginemen, assistants, &c., besides the interest on capital, being considerably less.

Some notion of the economy of power likely to arise from superseding the use of ropes may be collected from the result of experiments made by Messrs. Stephenson and Locke on the resistance arising from the friction of ropes. They found that a load of 52 tons drawn by stationary engines worked by ropes through mile and half stages, offered a total resistance amounting to 1156 lbs.; of this 582 lbs. arose from the friction of the load, and 574 lbs. from the friction of the ropes. In the case of the pneumatic railway, the friction of the rope is replaced by the friction of the air-pumps and of the impelling apparatus, and it will be evident that the latter, compared with the former, must be almost insignificant. Hence the power wasted in its transmission from the stationary engines to the load, which in one case amounts to 50 per cent. of the whole moving power of the engine, in the other is of comparatively trifling amount.

Slopes on railways will always be objectionable whatever power be used; for even the most gentle ascent will increase the resistance of the load in an enormous proportion. The difficulties, however, which they present are materially less when the line is worked by stationary than by locomotive engines, and would be still further diminished by superseding the rope; the resistance

arising from the rope being always greater on inclined planes than on the level, owing to its increased thickness and consequent weight. A load which requires a 4½ inch rope for the level requires a 5½ inch rope upon a slope of 1 in 100. The weights of equal lengths of these ropes would be in the proportion of about 2 to 3, the slope requiring one-half more weight of rope than the level. Besides this, the moving power on a slope, in addition to the ordinary friction which it has to overcome on the level, has likewise to draw up the weight of the rope, —a resistance which will be increased in proportion to the acclivity of the slope.

The disadvantages produced by slopes when locomotive engines are used are still more formidable. The same engine which is fitted to work upon the level is altogether inadequate for the slopes, the consequence of which is, either that the locomotive is strained beyond its power by working up the slopes, and rapidly destroyed, or that the engines must be more powerful than is requisite for the common level of the road, and thus power and expense wasted; or finally, that an auxiliary engine must be kept constantly ready at the foot of each slope, with its fire lighted and its steam up, ready to help up the trains as they arrive. Unless the trains be almost incessant (which, even on the most frequented railroad, they never can be,) this last expedient, which is the one adopted on the Manchester line, is attended with great waste of power and expense. Stationary engines worked on the pneumatic principle would effectually remove all these difficulties and objections.

The weight of the trains which could be drawn upon the pneumatic railway, and the speed of the motion imparted to them, would entirely depend upon the power of the stationary engines. As the friction or other resistance does not increase with the velocity, the same absolute expenditure of power would draw the same load at whatever speed. The high speed attained by locomotive engines has been attended with great expense, but this has not arisen from the increased expenditure of power. It has been caused by the wear of the egines themselves, consequent on their rapid motion on the road, and by the necessity of sustaining a fierce temperature in the fire-place, in order to be able within the small compass of these engines to generate steam with sufficient rapidity to attain the necessary rate of motion. As the magnitude of the stationary engines would not be limited, and as they would not be subject to the injurious effects of motion on the road, steam could be produced in sufficient quantity for the attainment of any required speed, without increasing its cost, or in any way impairing the machinery.

One of the obstacles to the attainment of great speed by stationary engines worked by ropes, is the delay produced in transferring the trains from engine to engine, and from station to station. The momentum imparted to them is lost at each change, and these changes occur every mile and a half, so that the train has scarcely attained its requisite speed, when its motion must again be checked in order to hand it over to another engine. This difficulty is removed by the pneumatic system: there being no rope to be detached and attached, the engine passes on by its momentum from station to station, and a contrivance is provided by means of a valve at the stations, by which it is brought under the operation of the next engine without stopping its motion.

Although the danger of accidents to passengers on the present railways worked by locomotive engines is considerably less than that of travelling by horse coaches on turnpike roads, yet serious accidents have occasionally occurred. These have generally arisen either from the locomotive engine running off the rails, from one train running against another, from the locomotive engine breaking, or, finally, from persons standing upon the rails being run down. In the pneumatic system there is almost a perfect security from these causes of danger. From the engines being stationary, and the tunnel rising between the wheels of the trains, it is evidently impossible for the carriages to run off the road; and from the manner in which the system is worked, it is impossible that one train can run against another. It happens also that the nature of the rails themselves, forming, as they do, merely ledges upon the sides of the tunnel, prevent the possibility of persons standing between or upon them.

In railways worked by stationary engines, serious accidents have occasionally occurred by the ropes breaking, while the train has been ascending a slope. In such cases the train has run down by its weight with a frightful rapidity, producing the destruction of the carriages and the loss of life. It is evident that this source of danger is removed by the pneumatic system.

An advantage possessed by this system above the edge railroad, deserves to be particularly noticed. In the edge railroad, the engines and carriages are kept upon the road by flanges, or ledges, raised upon the tires of the wheels, which press on the interior of the rails. Every thing which causes the carriages to press on the one side or the other, causes these flanges to rub against the rails. When a curve or bend happens in the road, the carriages are guided by the pressure of one or the other flange on the side of the rail, which of course is accompanied by considerable friction. In the pneumatic railway there are no flanges, either on the wheels or rails; the carriages are guided by wheels, or rollers, placed in a horizontal position, and acting upon the external sides of the channel which receives the valvular cord. By this means all resistance which arises from what is called rubbing friction, is removed, and every surface which moves upon another, moves upon it with a rolling motion.

It is well known, that notwithstanding the prosperous condition of the Manchester Railroad Company, yet their expenditure in locomotive power has been so enormous as to cause considerable anxiety on the part of the managers, and some of them have even inclined to the opinion, that the question of stationary power deserves to be reconsidered. This opinion would probably be confirmed and strengthened, if the practicability of the pneumatic system were satisfactorily demonstrated by experiment upon a sufficiently large scale.

On the whole, it appears to me that if the mechanical difficulties of maintaining the pneumatic tunnel sufficiently air tight be overcome, the system presents a fair prospect of being practically successful. These difficulties are not so great as they may at first appear. It should be recollected, that nothing approaching to the *exhaustion* of the tunnel can be necessary; nor even any considerable degree of rarefaction. Supposing the tunnel to have an internal diameter of 40 inches, the impelling diaphragm would have a surface of about 9 square feet. If in such a tunnel a degree of rarefaction were produced, sufficient to cause a barometric gauge to fall two inches, (which would be an extremely slight degree of rarefaction indeed,) an impelling force would be obtained amounting to one pound on every square inch of the suriface of the diagram, which would give an mpelling force of more than half a ton. It is calculated, that on the common railways the amount of load is above 200 times the force of traction, and it would therefore follow, that this force would be sufficient to draw a load of 100 tons. If an additional inch of mercury be made to fall in the barometric gauge, to balance friction, &c. still the rarefaction would be extremely inconsiderable, and the contrivances to prevent leakage would appear to be attended with no great mechanical difficulty.

From the various reasons which I have above stated, I am of opinion that the present project would, if carried into execution, be likely to be attended with greater economy and safety than any other method of working railways now practised; and I see no reason against the attainment of as much speed as is obtained by the locomotive engines. At all events, having explained the reasons on which I have grounded this opinion, every one can judge to what weight it may be entitled. The project would appear to be well deserving of trial on some railroad of limited length, such as that between London bridge and Greenwich, where it would be sufficient to have stationary engines at the extremities. In such a case, I see scarcely any limit to the speed which might be attained with safety; and the economy, as compared with locomotive engines, would probably be very great.

DION. LARDNER.

London, Feb. 19, 1835.

[From the Richmond Compiler.]

NEW MOVING POWER.—The article below from Mr. James Herron, civil engineer, upon the subject of *a new propelling power* upon railroads, is one which deserves, and will unquestionably receive, the calm and dispassionate consideration, not only of scientific men, but of all who feel an interest in the advancement of science. The friends of Internal Improvement should give it their most patient attention. Its novelty may startle them, but what great suggestion in any age did not at first excite doubt of its feasibility? Witness the fate of Fulton and Oliver Evans. They were deemed insane and visionary in their day, but they are now ranked amongst the wisest men of our country, and the sigh of regret often escapes at the ingratitude and dullness of their countrymen.

Mr. Herron may expect to combat with incredulity, ignorance, and personal rivalry; but still he will find intelligent men disposed to consider with an impartial disposition the merits of his scheme. We pretend to but little science, but we confess we are struck with the feasibility of his plan. We think it deserves examination, and we are glad to find that an engineer, high in the estimation of the public, not only gives Mr. Herron's views a fair and liberal consideration, but seems disposed to concur in the principles upon which they are based.

In this era of improvement, every man who can make even the slightest addition to the cause of science, should be encouraged to the fullest exertion of his faculties for the public weal.

Hydrodynamic Railway, or the Application of the Power of Rivers to the Rapid and Cheap Transportation of Produce and Merchandise.

It has long been with me a matter of doubt, whether the water used in the lockage of

canals was not in many cases an injudicious application of a valuable power, as in the case of a canal located along the valley of a great river having considerable fall in its bed, like that of the river James, which has 1222 feet fall from Covington to tide water, or about 4.74 feet per mile, rendering at least one lock necessary for every two miles in the average.

On investigating the subject, I find that the water power of the river is of itself equal to the transportation of a greater quantity of tonnage than can be passed through the largest canal, and this too with the astonishing rapidity peculiar to railroads.

I will therefore lay before you, in as succinct a manner as possible, this new though simple deduction of science.

The locks of the Chesapeake and Ohio Canal are 100 feet long, 15 wide, and, say we take one of the most approved lift, 8 feet, the "prism of lift" will then contain 12,000 cubic feet of water, which will weigh 750,000 pounds. Every time the lock is emptied, this quantity is transferred from a superior to an inferior level. If the valves are opened simultanecusly, I am informed that the lock can be filled and emptied in little more than two minutes; but say that it takes three. Now, this water is power, and if it were applied to a properly constructed "breast wheel," or where the fall of water is greater, to a "pitchback," we should have four-fifths of it available to set any machinery we think proper in motion. Let it be applied to an endless chain or rope, passing over suitable rollers along the line of a railway, after the manner of the stationary system of steam engines, we shall have a water power railway, entirely free from the objections that can fairly be urged to the stationary steam engines, of the necessity of keeping up the fire and steam, &c.

When the stations are two and a half miles apart, one twentieth of the power, according to Tredgold, will be expended in moving the chains; but I will allow a tenth of the power to effect this object on two mile stations, the chain being worked but for one mile.

We have then the four-fifths of 750,000 pounds, (the one-fifth being lost in the application to the water wheels,) equal 600,000 pounds, which, falling 8 feet in three minutes, is equal to 1818 pounds moved half a mile in the same time; which is at the rate of 10 miles an hour. Deducting from this the one-tenth, as that part lost in moving the chain, leaves 1637 pounds. And as 10 pounds are equal to the transportation of a ton, with the commonest railway wagons, it follows that the above power is equal to the transportation of 163.7 tons over half a mile of the road, while a boat would be passing through the lock of the canal; or it will transport 81.8 tons over a mile of the road in the same time, which is at the rate of twenty miles an hour!

But the maximum rate of transportation on canals is 2½ miles an hour, and as the mass moved is inversely to the velocity, we shall at this rate be able to transport 654 tons.

The water used would be at the rate of 66.6 feet per second. James river, even at Covington, in a dry season, yielded nearly three times this quantity, as appears from the Report* of Mr. Crozet, who measured Jackson's river and Dunlop's creek in August and September, 1826. The mean of the results obtained by this engineer is 177.6 cubic feet per second, or 10,656 feet per minute; and we have this quantity with 7.11 feet fall per mile, the average down to Pattonsburg; before reaching which, however, the volume of water is more than doubled; and as we descend the river, although we have less fall per mile, we have at least six times the quantity of water to compensate for it; and the fall is still about 3½ feet per mile.

The heavier trade being descending, will add to the effect of this power; but disregarding this favorable circumstance, omitting the decimals in the fall per mile, and taking the minimum quantity, we have 10,656 cubic feet of water, equal in weight to 666,000 pounds, which, if permitted, will of course fall the 7 feet in a minute, and is therefore equal to 4,662,000 pounds falling one foot. Deducting one-fifth for loss in application, leaves 3,729,600 pounds. Now the load we can transport will depend on the velocity at which we would travel—say that it shall be 10 miles an hour, which is 880 feet per minute.

Dividing 3,729.600 by 880, the quotient is 4,238 pounds, moving with the velocity of 10 miles an hour!

From 4,238 deduct the one-tenth part, for that lost on mile stations, in moving the chain, or rope; and dividing the remainder by 10 for the friction per ton of the carriages, and we have 381.5 tons transported at the rapid rate of 10 miles an hour!

And as each and every mile furnishes its own moving power, it follows that it is equivalent to keeping this quantity in motion on each mile throughout the line at the same time. And as the distance from Richmond to Covington is 257½ miles, this may amount to the enormous quantity of 98,236 tons; or to the transit and delivery of 3,815 tons hourly!

Having thus demonstrated the amplitude of this moving power, to an extent probably far beyond any demand we shall be able to make on it—which will be better understood by the general reader from the fact, that but 17 hours would be equal to the transportation of a greater quantity of tonnage than passed over the whole Baltimore and Ohio Railroad in a year, ending 30th September, 1833—it now remains to show that it can be employed at a reasonable expense.

The expense of erecting works for hydrodynamic transportation will depend on their scale, or magnitude, and on the greater or less permanent character of the materials used in their construction; also, on the extent to which we would employ the motive power. With regard to the latter, however, it should be observed, that we obtain it so cheaply, and in such excess, as to obviate, to a great extent, the necessity of expensive grading. This adaptation of fixed power to an undulating surface, of any degree of slope, renders it peculiarly applicable to mountain localities, as by its means we can cross the bends of the river, thus shortening the distance, while a canal, or even an ordinary railroad for locomotives, should be conducted round them.

Another important advantage derived from the employment of this cheap power, is that we can substitute, for the iron rail, a broad granite tramway, similar to that extending from London to the West India Docks; which, although it will cost more per mile in the first instance, yet it will have great permanency to compensate for this. But the most important advantage to be derived from the granite tramway, is, that any man may bring his own farm-wagon, and, leaving his horses behind him, be drawn to market at a rate of 10 or 20 miles an hour, which would be in less time than would be spent in passing the locks of a canal: thus freeing the work entirely from the odious charge of monopoly brought against railroads.

To form an estimate of the cost, it will be necessary to suppose the works adapted to some definite amount of trade. Say that it shall be to the delivery of 100 tons per hour, or to the transportation of 50 tons at a time, at the rate of 10 miles an hour.

For this purpose I will suppose it necessary to erect a dam at every four miles; and that they may be built in the most substantial manner of stone masonry, I will estimate them at $10,000 each; the average width of the river up to the Blue Ridge is 699 feet; above the Ridge, it will only be 275 feet. For water wheels of the best and most durable construction, say $3000.

Thus we have 13,000, which, divided by 4 miles, gives $3250 per mile, as the cost of the moving power.

Estimate of the expense.

Motive power, or proportional cost of dams per mile, - - -	$3,250
Ropes, a double line per mile, -	1,800
Rope rollers, put up, - - -	850
*A broad granite, or marble tramway, double track, - - -	8,000
Grading and bridging per mile, say	2,000
	$15,900
Add 10 per ct. for superintendence,	1,590
	$17,490

High and unfavorable as the above estimate is, yet the whole cost of the moving power, including dams, water wheels, ropes, and rollers, will be much less per mile than such locks as those of the Chesapeake and Ohio Canal, which cost, as I am credibly informed, $1500 the foot lift.

I have estimated for ropes, as they are in more general use than chains; and the above will be the cost of the newly invented rope, saturated with India rubber, expressly for this purpose; which is said to increase its strength as well as its durability.

When the stations or water wheels are placed 4 miles apart, each wheel would have to work 2 miles of the road at a time; but did the trade require it, double, or probably treble the foregoing tonnage, could be delivered by erecting an additional water wheel at each station.

The following is the estimate of the amount of power to work the 4 mile stations, which those conversant with the subject will perceive to be very ample.

Friction and resistance of two miles of rope, - - -	600 lbs
Ordinary friction of 50 tons of carriages and goods, 10 lbs. -	500 do.
Allowance for occasional gravity, at 20 lbs. per ton, - -	1000 do.
Power allowed at the rate of ten miles an hour, - - -	2100 do.

2100 pounds moved 880 feet in a minute, is equal to 1,848,000 pounds moved 1 foot; which is equal to 154,000 pounds falling 12 feet in the same time, which is, also, equal in weight to 2464 cubic feet of water. To which add one-fourth, for loss in application, and we have 3080 feet per minute, or rather more than 51 feet per second.

For the sake of conveying an idea of the probable cost on a large scale, I have sup-

* 5 Vol. Board of Public Works, page 108.

* Wood and iron rail tracks, like those on the Petersburg Railroad, could be laid in a double track for 6000 dollars a mile. They would last much longer than when locomotives are used.

posed isolated dams to be used at regular distances, but the engineer will of course adapt his works to suit particular localities, sometimes preferring a continuous canal, substituting water-wheels in place of locks, and thus discharging the water, as it is used, into the next consecutive reach below. Or where great length of level occurs, the wheels may be made to discharge their water into the river, to be again taken out of the next dam.

On canals already constructed, where they have considerable lockage, and plenty of water, it is obvious that the trackage may be effected by the foregoing means; that is, by erecting a water-wheel along side of a lock, and extending a chain down the margin of the canal on the one side, which would be returned up the other.

And as they no longer need the tow-path, they may lay a light rail track, on which passenger cars may be drawn by the same power at any required velocity.

But in many cases, where they have not a superfluity of water, they had better substitute water wheels for their lock gates, widen their tow-path, and lay down a railway.

In conclusion, I invite investigation by men of science, as it is certainly a subject of great importance to the country, now so extensively engaged in works of internal improvement.

JAS. HERRON,
Civil Engineer.

Richmond, Va., May 26, 1835.

[*From the Albany Argus.*]

CANAL TOLLS.—In publishing a statement of the amount of tolls collected upon the several state canals, for April and May, there was an omission of the sum collected on the Champlain canal for May, making the total appear about $14,500 less than it really was.

The amount of toll received upon all the canals for April and May, is $368,204 10.

The following is a comparative statement of the collections of tolls for April and May, for the last six years, viz:

	April.	*May.*	*Total.*
	ERIE CANAL.		
1830,	77,327 12	154,972 95	$232,300 07
1831,	112,136 84	202,873 25	315,010 09
1832,	37,375 83	212,054 17	249,430 00
1833,	88,606 39	213,523 31	302,129 70
1834,	91,877 58	177,662 26	269,539 84
1835,	122,784 42	214,738 54	337,522 96
	CHAMPLAIN CANAL.		
1830,	133 16	11,165 96	11,299 12
1831,	4,163 15	16,448 14	14,611 29
1832,	464 76	3,517 89	3,982 65
1833,	3,352 90	11,393 98	14,746 88
1834,	5,077 53	16,454 26	21,531 79
1835,	3,137 75	14,569 53	17,707 18
	OSWEGO CANAL.		
1830,	7,50 13	2,058 95	2,808 08
1831,	1,180 29	2,829 06	4,009 35
1832,	464 76	3,517 89	3,982 65
1833,	1,026 84	3,828 33	4,855 17
1834,	1,949 94	2,705 34	4,655 28
1835,	1,378 94	3,870 19	5,249 13
	CAYUGA AND SENECA CANAL.		
1830,	956 60	1,905 79	2,862 39
1831,	1,214 19	2,663 42	3,877 61
1832,	392 37	2,101 71	2,494 08
1833,	830 67	2,771 62	3,602 28
1834,	1,094 38	2,887 08	3,981 46
1835,	2,084 71	3,863 76	5,948 47
	CHEMUNG CANAL.		
1834,	100 90	407 17	508 07
1835,	233 59	726 04	959 63
	CROOKED LAKE CANAL.		
1834,	191 10	245 45	436 55
1835,	455 60	461 13	916 73

The tolls collected in April and May, 1835, exceed the collections for the corresponding months of 1833, by the sum of $42,870 06; and exceed the collections of 1834, during the same time, by the sum of $67,551 11.

Since 1832, the tolls have been reduced a fraction more than 35 per cent.

Fig. 2.

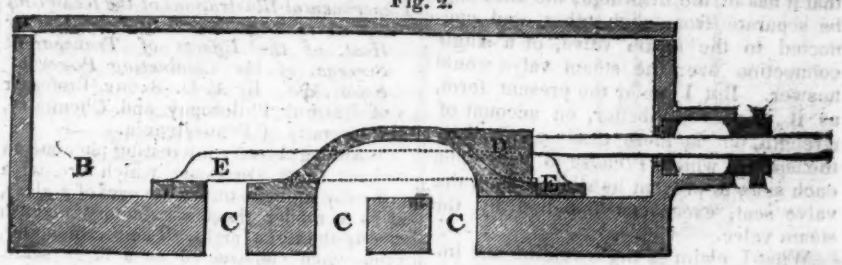


Fig. 3.

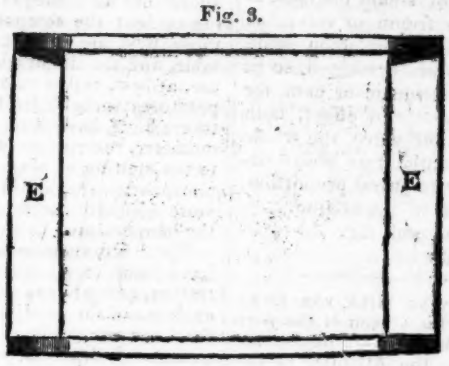
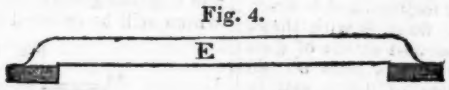


Fig. 4.



[For the Mechanics' Magazine.]

Specification of a Patent granted to THOS. B. STILLMAN, *for an Improvement in the Valves of Steam Engines.*

To all whom it may concern—Be it known, that I, Thomas B. Stillman, of the city of New-York, in the county and state of New-York, have invented a new and useful improvement in the valves of steam engines, the object and intent of which is to combine the common slide steam valves with a cut-off valve, so that both may be operated by the same eccentric, or cam, upon the same seat, and each retain their distinctive character for the particular purposes of a steam and cut-off valve. And the method by which I obtain such object is fully set forth in the following specification, and in the drawings thereunto annexed, which make a part of said specification.

The valve which I propose to adopt, will apply, with trifling variations, to most of the different forms of sliding steam valves that are now in use. But the form to which I shall confine myself in this description is that called the single short slide valve, the adaptation of said valve to which will enable me to explain its principle in the fewest words.

Fig. 1* is a perspective of a steam chest containing the steam and cut-off valves, as hereinafter described. Fig. 2 is a longitudinal section of steam chest and valves. Fig. 3 is a plan, and fig. 4 is a side view of the cut-off valve. The letters of reference designate the similar parts in the several figures. A A is a steam chest, the lever being removed to show the valves within. B is the valve seat, which is made somewhat longer than the usual proportions, for the purpose of admitting the cut-off valve upon it, within the steam chest, and also to allow the steam valve more vibration than is commonly necessary. C C C, are the openings in the valve seat, over which the valves operate. D is the common slide valve, with the valve rod passing through the end of the steam chest. E E is the cut-off valve, which may be formed of several pieces, or cast in one piece of brass, or other metal suitable for the purpose. The two ends of this valve are faced to suit the face of the valve seat, and the inner edges are jointed to the ends of the steam valve so as to be steam tight when in contact, which will be alternately at each end of the valve when in operation. The distance between the inner edges of the ends of the cut-off valve should be equal to the length of the steam valve, and of one of the openings in the valve seat. Through the space formed by this difference of length, the steam enters the openings. But the stroke of the valve is not complete until the end of the cut-off is drawn over the opening now seen between the two valves in figure 1. The steam will be cut off at half stroke, if the valves are worked by an *eccentric*, but when a *cam* is used, it may be cut off at any required proportion of the stroke. When the operation of the cut-off is not required, as in starting the engine, the stroke or throw of the valve is diminished by means of a moveable arm in the rocking shaft, with an adjusting screw, or otherwise, which decreased stroke leaves the cut-off valve nearly at rest upon the valve seat, while the steam valve continues to perform its functions. It is not essential that the cut-off valve should preserve the frame form

* Fig. 1 is omitted.

that it has in the drawings; the ends may be separate from each other, and connected to the steam valve, or a single connection over the steam valve would answer. But I prefer the present form, as it is not only better, on account of strength, but is more easily confined by the springs which I cause to bear upon each side, to prevent its sliding upon the valve seat, except as impelled by the steam valve.

What I claim as my invention and improvement in valves of steam engines, is the attaching of the frame or valve, as above described, to the common slide valves by which they are combined, so as to require but one eccentric or cam, for their proper movement and effect, both as a steam and cut-off valve, the whole being effected substantially as above described, and in any required proportion, according to the size of the engine.

In witness whereof, &c.

December 1, 1833.

Mode of Preserving Milk for Long Voyages.—Sir: As the season of the year is now arrived when hundreds of mechanics are induced to cross the Atlantic, in the hope of bettering their fortune, and to those who may carry young families with them, milk may be an important article of diet, perhaps the following extract from an old newspaper of the date of 1822, setting forth a simple and easy method of preserving it, may be of importance; more particularly as I perceive from your last monthly list of new patents, that a method of preserving animal milk has just been patented—whether the same or a different method remains to be seen:

"Provide a quantity of pint or quart bottles (new ones are perhaps best;) they must be perfectly sweet and clean, and very dry before they are made use of. Instead of drawing the milk from the cow into the pail as usual, it is to be milked into the bottles. As soon as any of them are filled sufficiently, they should be immediately well corked with the very best cork, in order to keep out the external air, and fastened tight with packthread or wire, as the corks in bottles which contain cider generally are. Then, on the bottom of an iron or copper boiler, spread a little straw; on that lay a row of the bottles filled with milk, with some straw between each, to prevent them from breaking, and so on alternately until the boiler has a sufficient quantity in; then fill it up with cold water. Heat the water gradually until it begins to boil, and as soon as that is perceivable draw the fire. The bottles must remain undisturbed in the boiler until they are quite cool. Then take them out, and afterwards pack them in hampers, either with straw or sawdust, and stow them in the coolest part of the ship. Milk preserved in this way has been taken to the West Indies and back, and at the end of that time was as sweet as when first drawn from the cow."

I am, Sir, yours, [J. Elliott.

March 30, 1835.

Propagation of the Silk Worm.—Last year, on the 4th of July, Charles Dyer, Esq., of this city, had *four* silk worms. From these four and their progeny, he had *three* complete crops of cocoons. There are now feeding, at the cocoonery of the Valentine Company in this city, about seven hundred thousand worms, all the product of the four which Mr. Dyer had on the 4th of July, 1834.—[Providence Journal.]

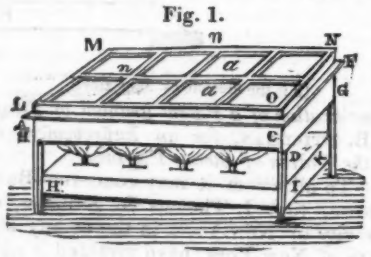
[From the Journal of the Franklin Institute.]

Experimental Illustrations of the Radiating and Absorbing Powers of Surfaces for Heat, of the Effects of Transparent Screens, of the Conducting Power of Solids, &c. By A. D. Bache, Professor of Natural Philosophy and Chemistry, University of Pennsylvania.

Among the very interesting phenomena of heat, there are many which are with difficulty brought under the eyes of a class, so as to render them satisfactory to each one by the test of sight. The thermometer, even when constructed on a large scale, affords but an inadequate means of rendering evident the temperature of bodies, to those who are distant from the lecture table, and the illustrations made by its use are, at best, rather tame. When the temperatures to be indicated admit of it, lecturers have, in preference to using the thermometer, resorted to the freezing of water, to the melting of wax, to the inflaming of phosphorus, the boiling of water, &c., as more adequate means of rendering evident the temperatures in question.

The instruments about to be described, I have found very convenient for class illustration, and always to afford satisfactory evidence of the positions to be proved. The first instrument is intended to show the powers of different surfaces in radiating and absorbing heat, with other phenomena, which will be referred to in the sequel.

Fig. 1.



To produce a sensibly uniform temperature, a prismatic vessel, A B C D F G, fig. 1, of sheet iron, of a convenient size, is filled with melted tin, and covered at top by a plate of sheet iron, A F, or, in preference, by a plate of cast iron, of moderate thickness. The temperature of the tin is kept up by an alcohol lamp, H I K, with several wicks, fitting below the box, and between the legs which support it; by this means, the top radiates heat of considerable intensity. I prefer the use of tin, in the box, to that of oil, on account of the greater cleanliness resulting from its use, and because the oil gives off an offensive smell at high temperatures. Boiling water does not give a sufficiently high temperature to produce rapid action in the apparatus, and the greater exactness with which it would yield a constant temperature is not necessary in such an illustration.

A rectangular frame, L M N O, made of dry wood, to prevent its warping, of a small height, L A, and of a length and breadth such as to adapt it to its place upon the cover of the box, A G, is divided by cross pieces of wood into small squares, or rectangular compartments, as *n n*, the upper surface of the frame being perfectly plain, and parallel to the cover, A F, of the box containing the melted tin; this frame is intended to support, without the necessity of contact with each other, small plates of thin metal, or other appropriate material, the surfaces of which are variously coated.

To show the *radiating powers of different surfaces*, any convenient number of thin plates of sheet lead, or sheet tin, or mica, are cut to suit the size of the squares, *n n*, of the frame, overlapping the inner edges, but not extending to the middle of the small dividing bars of wood; each one of the plates has one of its surfaces differently coated; supposing them to be of lead, one is coated with lampblack, another brightened by sand paper, or coated with tin leaf, another left tarnished, a fourth coated with gold leaf. Being placed upon the frame, as at *a, a*, with the coated sides uppermost, small bits of phosphorus are placed upon the middle of the plates, and the frame put in its place upon the cover, A F. The surfaces which absorb the heat radiated by the cover, A F, being the same, the material and thickness of the plates being the same, the circumstances are alike in each plate, except so far as the upper surface is concerned; the plate which is coated with the worst radiator, will become warm first, and the phosphorus will melt first upon it, and, generally, the order of melting of the phosphorus will indicate the inverse order of the radiating powers of the surfaces. As the heat radiated from the cover is high, the melting of the phosphorus will be soon followed by its inflaming, and the order thus given will hardly deviate from the first; the interference from the film of oxide, which is so annoying in the modification of the apparatus of Ingenhousz, for illustrating the relative conducting powers of bodies, is almost entirely obtained by the high temperature of the source of heat. To avoid injuring the coated surfaces, a thin film of mica may be placed below the phosphorus, the film being large enough to prevent the effect of the spreading of the phosphorus, as it burns.

The plates should be made thin, in order that the results may be mainly dependent upon differences in the radiating power of the surfaces. I have used plates of thin sheet tin, (iron coated with tin,) of sheet zinc, and of glass, with good effect. The effects may be accelerated by coating the under surfaces with lampblack, to promote the absorption of heat; but in that case, care should be taken that the thickness is at least equal to that which produces the greatest amount of absorption.

Instead of the pieces of phosphorus, wax, or other readily fusible material, may be used, as in the apparatus of Ingenhousz; or cones of wood, weighted at the base, and kept upon the plate, with the vertex downward, by a fusible material, may be substituted.

It may happen that the lecture table is so arranged as to render it advantageous to incline the cover, A F, of the box, A G; this will be readily accomplished by making the cover part of the box itself, in which case the melted metal may be introduced through a hole in the higher side; as, for example, in A D.

To illustrate the fact that *absorption and radiation are proportional*, the same square plates, *a a*, &c., may be used; the variously coated surfaces are placed downwards, phosphorus is put, as before, on the upper surfaces, and the frame deposited in its place upon the cover of the box. The phosphorus will now melt in the inverse of the order shown in the first experiment, the plate having the best absorbent surface heating first. If plates of metal be used, their upper surfaces should be bright, for this illustration; but glass, or mica, which will allow the coating to be seen through, is best adapted to the purpose.

The fact that the *radiation*, or *absorption*, of heat, *does not take place merely at the surface*, but at a definite thickness, which

becomes very appreciable in good radiators, may be satisfactorily shown by coating the surface of one of the plates with a thin layer of lampblack, and another one with a considerable thickness of the same material. If the coatings be upwards, as in the first illustration, the phosphorus will melt soonest upon the thinly coated plate; if the coatings be downwards, as in the second illustration, the reverse will be the case.

The *effect of transparent screens* in preventing the passage through them of heat not accompanied by light, may be shown by using, in the same instrument, plates of glass, mica, &c., of equal thickness; theoretically, the differential results are not as free from objections as the former ones; but the fact is illustrated almost unexceptionably, since the phosphorus melts first at the surface of the plate, which it would not do if the plate were cool, and the fusion resulted from the absorption, by the phosphorus, of the heat which had passed through the screen of glass, or mica.

These illustrations I have tried repeatedly, and successfully; there are others of a more refined character, which I have not yet had an opportunity to attempt, but which, I doubt not, might be carried out very easily. The first of these is the curious property discovered in rock salt, by M. Melloni, of permitting the passage of heat of low intensity, as freely as that of high; a piece of phosphorus placed upon the salt, and another upon a thin film of mica, the under surface of which should be coated with lampblack, just above the plate of rock salt, would serve to show this property. That transparent plates of mica are only partially diathermous, would be shown in a similar way, and, in fact, by the relative periods of fusion of the phosphorus just above the plate, and of that upon it, a notion of the relative quantities of heat stopped and transmitted might be furnished.

Another illustration which I have tried with success, is that of the want of specific effect of color on the absorption of non-luminous heat: a fact which some researches, undertaken by Professor Courtenay and me, and not yet published, indicate. On coating the plates on one side with lampblack, plumbago, white lead, chalk, prussian blue, vermillion, &c., it will be found that the phosphorus melts upon them without regard to the order of color. Care should be taken that the thickness of the coatings is such as to give to them each the maximum radiating or absorbing power; a thickness which will differ for each material, but which may, for all, be very easily exceeded.

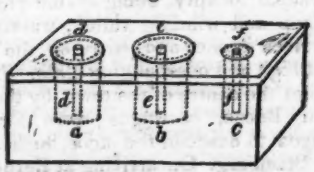
By a change in the character of the plates, this instrument may be used to advantage in showing the experiment devised by Franklin, and executed first by Ingenhousz, for indicating the relative *conducting powers of solids* for heat.

That the experiment just referred to does not truly give the relative conducting powers of bodies, can, I think, be clearly demonstrated, notwithstanding that it is found, in all the books, in juxtaposition with the very elegant and accurate method proposed by Fourier; with the explanation of its intrinsic defects, it may be, however, still admitted as a general illustration. To apply the instrument, plates of the same thickness of the substances to be tested, as, for example, of tin, iron, lead, copper, pottery, wood, glass, &c., which can be easily obtained in the requisite form, are to be coated on both sides with a thick coating of lampblack, or other good absorbent and radiator, leaving a small strip of the upper surface bare, to exhibit the nature of the material; the plates having phosphorus placed, on mica, upon them, are put upon the frame, and this is placed on the cover of the box: the order in which the phosphorus fires, gives the same indication as in the apparatus of Ingenhousz. This effect is more rapid than when cones, or rods, are used, especially from the lower temperature of the substance which is commonly used as a source of heat. These remarks do not apply, of course, to the forms of that apparatus in which hot sand is used.

The second instrument to be described is intended to show the common illustration of the fact that bodies have *different specific heats*.

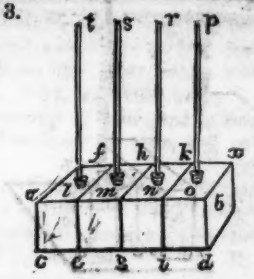
Theoretically, this illustration is, I think, inaccurate, but is *admissible*, like the last; upon this subject, I hope to be able, at a future time, to be more explicit; at present, my remarks are confined to general illustrations. That different bodies require unequal quantities of heat to raise their temperatures through the same number of degrees, is illustrated upon equal weights, or bulks, by subjecting them, when at the same temperatures, to the same source of heat, and proving that they require different times to arrive at the same temperature. This idea is a fundamental one, and cannot too early be inculcated upon a learner. As an illustration, I have three vessels of sheet iron, to contain equal *weights* of mercury, alcohol, and water; these are fastened to a frame, by which they can be dipped into the same vessel containing hot water. An alcohol thermometer, with a column of fluid large enough to be visible at a moderate distance, dips into each vessel. As the heat enters, the thermometer in the mercury rises with great rapidity, that in the alcohol more slowly, and that in the water lags behind both the others. Instead of those thermometers, if a cylinder of any metal which is a good conductor, and has a low specific heat, such as copper, for example, should, after being coated with a varnish of thickened linseed oil to protect the surface, be introduced into each vessel, phosphorus placed on the top would melt and inflame first on the metal which dipped into the liquid having the least capacity for heat. In the annexed cut, fig. 2, *a*, *b*, and *c*, are the vessels; *d*, *e*, *f*, metallic cylinders resting in wooden, or metallic, or mica, disks, and the whole dipping into a vessel, *m n*, of boiling water. The mercury is so small in bulk, that the influence of this strikes the student immediately; but the idea which he thus catches at, is refuted by the more tardy heating of the water, which is less in bulk than the alcohol.

Fig. 2.



Before the forms of illustration, of the radiation and absorption of heat, already described, had suggested themselves, I had contrived another apparatus, which gave very good results, and may be, by some, preferred to the one already described. A long box, *a b c d x*, of tin, was divided into compartments by partitions, *e f*, *g h*, *i k*, &c., and a top soldered upon each, having

Fig. 3.

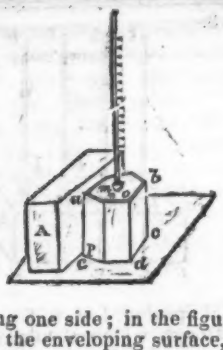


a conical opening, *l*, *m*, *n*, &c., to receive a cork, through which a tube, *o p*, *n r*, *m s*, *l t*, &c., passed; these compartments were made as nearly equal as possible, and the tubes entering them were selected of as nearly equal bore as possible; equal measures of colored water were poured through the conical openings into the several compartments, so as to cover the bottom to a depth regulated as will be presently stated. The tubes and corks were now inserted, and cemented; and each cell thus formed an air thermometer, the expansion of the air within driving the colored liquid up the tube entering the cell. That there might be no error from a want of equality in these thermometers, after bringing the liquid to a convenient height in each of the stems, by forcing air into each, or by dropping liquid from a dropping tube into the tube, the whole was plunged into a vessel of water, of a temperature sufficiently above the original temperature of the air within, to give distances on the tubes, readily divisible into equal parts of sufficient magnitude. These degrees were marked by a rude scale, formed by colored threads, tied around the tubes. One surface of the box was kept uniformly bright, or regularly tarnished, or coated; the other, *a d*, was coated with substances of different radiating powers.

The box being placed with the uncoated side towards a vessel of warm water, the heat enters uniformly that side of the compartments, but is radiated differently from the opposite side, and the liquid from the air thermometers is urged more rapidly up those tubes which enter into the compartments radiating worst, and ultimately arrives at a greater height, showing a greater stationary temperature, or temperature of equilibrium, between the heat absorbed and that which is radiated. If the vessel be now turned, so that the variously coated surfaces are towards the source of heat, the liquid in those coated with the best absorbents will immediately begin to rise in the tubes, and that in those coated with the worst absorbents, to fall. That the two lateral compartments are exposed to a greater cooling action than the others, may be an objection to this apparatus; but it is easily obviated, and with it the communication of heat from one compartment to another, by terminating the box at each end by a small compartment, and separating each of the other compartments of a similar space; in fact, convenience alone was the reason for uniting these air thermometers in one vessel.

Another form of apparatus, which is more simple, I have found convenient; but it occupies more time than that last described, in obtaining the same result. A prism of any convenient number of sides, is made into an air thermometer, in the manner described in speaking of the last apparatus; the sides are variously coated; it fits loosely into a prism of the same form,

Fig. 4.



but wanting one side; in the figure, *a b c e*, represents the enveloping surface, and *m n o p*, the air thermometer. To show the different absorbing powers of the different substances, the vessels described are placed as in the figure, before another, A, containing hot water, hot sand, or any other convenient source of heat. Supposing the side of the air thermometer, which is the worst absorbent of heat, to be exposed to the source of heat, the air within is expanded, and the position of the liquid in the tube is marked by an index; a better absorbent is exposed, and the liquid rises higher; a worse, and it falls below its original level; the experiment can thus be varied at pleasure. The outer sheath, or covering prism, serves to render the surface, not exposed to the source of heat, uniform in its radiating powers, and to protect those sides which are not intended to be exposed to the source of heat, from the radiation of the vessel, A, which, otherwise, would affect them sensibly. If the air thermometer were a rectangular prism, of course the objection just stated would not apply; but the sheath would still be necessary to equalize the radiation from the surfaces not exposed to the source of heat.

To show the radiating powers of the different surfaces, the sheath is turned so that the open side is exposed to the air; the absorption of heat now becomes sensibly constant, and the greater or less height of the liquid in the tube is determined by the less or greater radiating power of the exposed surface.

The order in which the surfaces are exposed may, of course, be so arranged as not to require the temperature of the source of heat to be kept constant.

Such an apparatus, placed before a stove, would make an admirable illustration in a school; or a vessel of water, colder or warmer than the room, may be used as the radiating or absorbing body. For the tin vessel here described, a common square glass bottle may be substituted, without disadvantage. Even a common glass phial, made into an air thermometer by inserting a tube through a tight cork, into some liquid occupying the lower part of the phial, and provided with a moveable coating of tin foil, gilt paper, writing paper, and paper covered with lampblack, when placed before a fire, or in a room of which the air is warm, when the external air is cold, brought near a window, will afford an interesting and instructive illustration.

Philadelphia, February, 1835.

Experiments to produce Light in Water.—An experiment, to ascertain at what depth a white object might be visible in the sea, has just been made by a gentleman who has devoted much time and attention to extend the bounds of science. Having let down a metal plate, painted with white lead, he was able to distinguish it by moonlight at the depth of forty feet; while, by that of the sun, he lost sight of it at about eighty feet. The difference must seem surprising when we compare the intensity of the two lights—that of the sun being, according to Bougner, *three hundred thousand times* stronger than that of the moon; but the dazzling which affects the eyes by the corruscation of the solar rays, does not allow us to be sensible to feeble impressions on the visual organs. Any instrument, therefore, which should enable us to see at great depth under water would be exceedingly useful, either in recovering any object that might be lost, or in constructing submarine works in sea-ports. A method used by fishermen to obtain this advantage consists in pouring oil upon the water, to make it more transparent. In the bay of Naples it is constantly practised by the fishermen at night. Their boats are provided with a composition which gives an intensely vivid flame, and is placed out at the stern. Attracted by the light, the fish follow it from every direction, keeping near the surface, and hovering around it like moths. They are then easily captured, after being struck or harpooned by four-pronged spears. Those who search for shell-fish (frutti di mare) in the day-time, near the shore, employ the same method, throwing little pebbles steeped in oil before them. The gentleman, who was acquainted with this simple contrivance, wishing to ascertain its efficacy, poured a small quantity of oil on the sea, and was thereby enabled to distinguish shells and other objects which had not been visible to him before. When oil is thrown on the surface of water which is not confined by banks, the coast extends itself to a great distance, becoming thinner and thinner, until it can no longer be distinguished separate from the water. The effect of the oil is, apparently, to draw off, as it spreads, those little objects which prevent the transparency of the water by floating on its surface. All the experiments hitherto made, tend to corroborate this assertion; one of them in particular is very conclusive. Half a spoonful of olive oil having been poured near the edge of a large oval sheet of water, on which the wind had blown a quantity of acacia flowers, it was observed, that, in a few seconds afterwards, one half of the surface was completely swept of these floating flowers, and that they were all collected on the opposite part. Similar experiments are still in progress.—[Literary Gazette.]

[From the London Mechanics' Magazine.]

DESCRIPTION OF THE FREYBURG SUSPENSION BRIDGE.

Translated from the German, by J. E. Terry, C. E.

The city of Freyburg, in Switzerland, is well known to most travellers for its remarkable locality, being seated partly in a deep and winding valley, watered by the river Saone, and partly on the adjacent high and overhanging cliffs. To arrive at the centre of the town, by the road from Berne, carriages were formerly obliged to descend the steep declivity of the Staalberg. On arriving at Bernegate, it seemed to travellers as if they had already got to the end of their journey, but great was their astonishment to be informed that they had yet to travel for half an hour before they could reach the city—to follow the several large windings of the river, cross it three times, then to ascend the long, difficult, and steep ascent called *Alt Brunnen Strasse* (Old Well-street), which was at all times enough of itself to dismay a traveller, and has proved the death of many a horse. The bad state of the roads, and defective plan of the streets leading to the centre of the city, increased the difficulty of approaching it. Industry, commerce, social life, all felt alike the influence of this almost isolated position of the place. But what could be done? The obstacles seemed insurmountable; the almost perpendicular cliffs on which the chief part of the town stands, seemed to mock the idea of forming a street through them of any tolerable degree of ascent; and had even this been possible, it would only have tended to increase the length of the windings. On the other hand, the idea of erecting a bridge, either of wood or stone, of a sufficient height to overcome the difficulty of the rugged ascents and descents, seemed too daring for contemplation, the height being upwards of 150 feet, and the length much greater. The expense, too, especially if stone had been employed, would have been out of all proportion to the means of the citizens; for the city is not rich, being but little frequented, and thinly populated, containing, exclusive of the suburbs, no more than 9,000 inhabitants.

Some of the more public spirited and zealous citizens, who had heard of the iron suspension bridges erected in other countries, at length proposed to raise, by subscription, the pecuniary means necessary for ascertaining the applicability of such a structure to the natural circumstances of Freyburg, and, if practicable, of actually constructing it.

As soon as the subscription reached a suitable amount, several eminent engineers were consulted, and after examination of the plans of different competitors, M. Chaley, the famous French engineer, who erected the wire bridges at Beaucaire, Chasey, and several other places in the south of France, obtained the preference. The contract agreed on with him on the 10th February, 1830, was to this effect: that he was to have, at different instalments, 200,000 (Swiss) francs, for the completion of an iron wire bridge; that the expense of the approaches on both sides, and the compensation to individuals for loss sustained in their property, should be defrayed partly by the subscribers and partly by the government; and that the contractor, M. Chaley, subject to certain conditions, should have the enjoyment of the produce from the tolls for 80 years. Some time afterwards, these conditions were considerably modified; it being agreed that M. Chaley's right to the tolls should be limited to 40 years, at the end of which time, the profits are to revert to the subscribers during 59 years, after which the toll is to cease, and the bridge to become the property of the canton, or common property.

The first general meeting of the subscribers took place on the 19th of March, 1830, when they appointed a committee of 10 members (afterwards increased to 20) to superintend the erection of the bridge.

Immediately after these arrangements, the necessary preliminary preparations were entered upon; but the political disturbances which broke out, in 1830–1, in France, and afterwards in Switzerland but particularly in the canton of Freyburg, had a most injurious influence on the undertaking—added to which, differences arose between the contractor and the committee, which tended greatly to retard the project. The general good will of the citizens, however, and the indefatigable zeal and activity of some of the leading members of the committee, re-called ere long the dormant project into life and activity. In March, 1832, the works were entered upon with great zeal, and the first stone of one of the porticos was laid, under the superintendence of the architects Kraser and Brugger. From that time the works were continued in every department without interruption; and, to facilitate their progress, a temporary bridge was thrown over the river Saone, it being for the ease and advantage of the workmen to get from one side to the other without loss of time.

The finances of the company were all expended, however, long before the bridge approached to its completion. But though the funds were exhausted, the ardor and generous feeling of the subscribers and donors were not. Government, which, from the beginning, had given its particular sanction and protection to the measure, came once more to its assistance, by granting leave for the opening of a lottery, which produced to the company the sum of 80,000 francs.

The work was now once more renewed with vigor, and on the 9th of June, 1834, the subscribers had the gratification of seeing extended across the valley, the first of the numerous wires which form the two main ropes or supports of the bridge. Next followed the fixing of the subordinate suspension wires, and the laying down of the beams to form the foundation or flooring of the bridge. The latter mentioned operation took place, it might be said, in a magical manner. The inhabitants were not a little surprised to find at their gates an unlooked-for, and, for foot passengers, a sufficiently solid bridge, where, ten days before, they had seen only two immense wire-ropes. After this, the other various inferior works soon followed, as the completion of the footway, the erection of the balustrade, &c. At length, on the 8th October, a carriage was driven over the bridge at full gallop, which was followed, on the same day, by the stage, or post coach, from Berne to Freyburg, enthusiastically greeted by a vast number of astonished spectators.

The balustrades, though simply modelled, present, nevertheless, a very handsome appearance. Any vehicle, be it ever so heavily laden, may safely venture over; and although the ear is at first rather startled at the noise of the trampling of horses, yet the most clear-sighted person cannot discover the slightest motion communicated either to the wire ropes or to any other part of the bridge. The traveller passing over does not feel the least vibration, and his astonishment finds no bounds, to think that he has arrived so soon, and in safety, across the deep gulf below.

As has been before observed, the whole structure is suspended by two large ropes of wire, firmly secured at each end, by being let into shafts made for that purpose. At each end the porticos, over which the ropes pass, serve for antagonist supporters, or counterforts. They are built partly of limestone, brought from Neuenberg and Neuenstadt, and partly of sandstone, which is got in the stone quarries in the neighborhood of Freyburg: all the blocks are, by way of greater security, connected with each other by means of iron cramps. The quantity of iron used for this purpose was 570 cwt. The height of the porticos is 65 Berne feet. The opening for the gateway is 45 feet high, 20 feet wide, and 19 feet in depth; the width of each pillar is 14 feet. About 160 feet from the porticos the shafts are situated; their depths are each 58 feet, and their diameters 32 feet. These shafts are hewn out of the rock on both sides, and comprise each three chambers, situated at a certain distance from each other, each containing three immense unwrought blocks of Neuenberg stone, to which the main wire ropes are fastened. The connecting wires or chains, 16 in number, are drawn through these vaults; they rest at the same time on 12 cast iron cylinders, and are held fast by 128 anchors or grapples, of a total weight of 1,024 lbs. These connecting ropes or ties serve the great main wire ropes as auxiliary supports, which bear up on both sides the great beams of the bridge flooring, by means of suspension wires or ties. The length of the main wire ropes is 1,280 feet each. They consist each of 2,000 separate wire threads, which united make a mass of 4,000 threads, or little chains, of a total weight of 960 cwt. Dependent from each of the two main connecting wire ropes, or inverted arch, hang 184 smaller suspension wire ropes, at about 5 feet asunder: these are made fast above through iron loops, and below are connected with hoops of iron, into which the beam ends which support the footway are firmly fastened. The longest of the smaller dependent ropes of wire is 60 feet, and the shortest half a foot; each is composed of 25 single wires, so that the roadway of the bridge is held up by more than 8,000 single wires. The number of beams which form the foundation or platform of the bridge, amounts to 166, held together by 328 hoops of wrought iron. Four lines of beams run longitudinally throughout the whole length of the bridge, upon which rest the two footways. On both sides, to separate the carriage-way from the foot-paths, are strong oaken balustrades, made in the form of St. Andrew's cross, the height of which is 4 feet. The carriage-way is 16 feet, and each footway 3 feet, wide: so that the total width of the bridge is 22 feet. Its total length, including the two counterforts, over which the main wire ropes are passed, is 941 feet; exclusive of the counterforts, its length is 903 feet; the carriage-way alone is 864 feet. Its height above the river, when measured 30th Oct. 1834, was 168 feet.

The quantity of iron used in this work was not less than 80 tons, and of wood 135 tons.

The weight sustained by the two main wire stays is 120 tons; and it is calculated to sustain the amazing and enormous weight of 2,400 tons. J. E. T.

The Menai Bridge.—A friend of ours, who lately crossed this bridge, was informed by a gentleman who resided close to it, and has erected standards by which to mark the degree of vibration to which it is subject, that during the late violent gales it was on several occasions so much agitated as to oscillate to the extent of eight feet six inches—that is, four feet three inches both ways, out of the straight line. We believe, however, that even a much greater rate of oscillation than this was allowed for in the calculations on which it was constructed.

[From the Utica Observer.]

Utica, May 22d, 1835.

A. G. Dauby, Esq.: Dear Sir,—I take the liberty of sending you the following correction of the statement in Williams' Register for 1835, of the length and cost of the New-York State Canals.

SUMMARY OF CANALS COMPLETED.

Name.	Length.	Cost p. mile.	Total cost.
Erie Canal.....364 } Feeders.....8 }	372	19,255 49	7,143,789 86
Champlain Canal....64 } Glen's Falls Feeder..12 } River navigation ab. Troy dam.....3 }	79	15,520 95	1,257,604 26
Oswego Canal	38	14,879 93	565,437 35
Cayu. & Seneca do..	23	10,295 85	236,804 74
Chemung.....do..23 } Feeder.....16 }	39	8,505 96	331,693 57
Crooked Lake..do..	8	19,597 11	156,776 90
Total miles,	559	Cost,	$9,692,106 68

or an average of $17,367 57 per mile.

The Chenango Canal is now constructing, to be completed in 1836, is 97 miles long, 1021 feet of lockage by 109 locks, and is estimated by the Canal Commissioners to cost 1,960,456 28, or $20,210 87 per mile, exclusive of land damages.—(Assembly Document of 1835, No. 296.) A. B.

[For the American Railroad Journal.]

Foot Railroads.

It is proposed to show in this article, that railroads for short distances may be used to advantage by men to transport themselves and moderate loads by their own strength.

1. In showing this, I may first state the force of traction required on railroads. The force of traction is measured by a weight suspended to a cord passing over a pulley. The traction, or tractive power of a horse, is said to be 125 pounds, because a horse at his ordinary labor draws with a force sufficient to raise up 125 pounds by a cord over a pulley. The tractive power necessary to move waggons on common roads, and cars on railroads, has been very accurately ascertained. If a waggon with its load weighs 2400 pounds, then, if a weight of 200 pounds is suspended to a cord passing over a pulley, which cord draws the waggon, this weight would move the waggon forward on a good level turnpike road. But a car on a level railroad, weighing with its load 2400 pounds, would be moved forward by a weight of only ten pounds, suspended to a

c

ord running over a pulley. If then a man could draw up a weight of ten pounds, he could, with the same rapidity that it ascends, move forward, on a level railroad, a car and its load weighing together 2400 pounds. If he could draw ten pounds up ten feet in a second, he could move the car and its load ten feet in a second; and if he could do this for an hour in succession, he could then move forward the car and its load 3600 feet in the hour. But if the railroad rises but 22 feet in a mile, the traction of 10 pounds will not move 2400 pounds up this ascent; but the traction of 10 pounds must be added, or the traction of 20 pounds will be needed; and if the ascent is 44 feet in a mile, another additional traction of 10 lbs. must be made, or there must be a traction of 30 pounds. The traction of 10 pounds, at 10 feet in a second, might be made to operate on a car 20 feet in a second; but the traction of ten pounds would not move a car weighing 2400 pounds 20 feet in a second, for it would propel only half the weight, or 1200; and if the traction of 10 pounds, at 10 feet in a second, were made to move a car 40 feet in a second, it would propel a car at this rate weighing only 600 pounds. With the same power with which a weight of 2400 pounds is moved forward on a level railroad 3600 feet, a weight of 600 pounds might be propelled four times that distance, or 14,400 feet.

2. What now is the power ordinarily exerted by a laboring man? Different estimates are made of this power. By Dr. Farey, a recent writer on the steam engine, the power of man is assumed to be equal to the raising of 60 cubic feet of water, which is equal to 3750 lbs. avoirdupois, through the space or height of one foot in a minute. A stout laborer, says Dr. Farey, will continue to work at this rate during eight hours per day. The relative values of the labor of a man and a horse, as to physical strength exerted, are variously stated. Some estimate them as 1 to 5, some as 1 to 6, and some as 1 to 7. The efforts of men differ with the manner in which these efforts are employed. It has been estimated by Mr. Buchanan, that the same quantity of human labor employed in working a pump, turning a crank, ringing a bell, and rowing a boat, are as the numbers 100, 167, 227, 248. The strength of man could be applied in the most economical way on a railroad, and so as to act with even more efficiency than in rowing a boat. He might sit in a reclining posture like a man pulling an oar, with his feet pushing against the flat boards of a small wheel, and by his hands drawing upon the slats of a drum wheel, instead of drawing upon an oar, while the wheel on which his feet operate, and that on which his hands operate, act on the same working point. This machinery might occupy but about the space filled by two chairs, or very little more than is required by one man to sit at his ease.

Attempts have been made to construct carriages by which a man might propel himself on common roads; but a knowledge of the power of traction necessary on common roads, would show that this is wholly impracticable. If a man's weight is 175 pounds, it would require an additional tractive power of 14½ to move himself on a common road, while this additional power would of itself alone move forward on a level railroad 3480 pounds; but for a man to move himself forward on a level railroad would require an additional traction of only two thirds of a pound, if his weight is 175 pounds.

If a laboring man ordinarily exerts strength sufficient to raise 3750 pounds 10 feet high in a minute, then he could propel 3750 pounds 240 feet in a minute, or half a mile in 12 minutes; or he could propel 937 pounds one mile in six minutes, or ten miles in an hour, and do this for eight hours in a day.

3. The attention may now be directed to the various occasions persons have to go, or to carry goods for short distances. Among the new and striking circumstances that in the city arrest the visitor from the country, is the throng of carts, and carriages, and horses, crowding the streets, and stunning his ears. This fact shows that there is a vast amount of conveyance of persons and loads from one part of a city to another. While such an amount of transportation is demanded by the necessities and convenience of the people of a city, it is manifest that railroads along some principal streets, reducing the freight of goods and persons to one tenth, or one third of its present cost, would be an immense gain to the community. The result would be that much mechanic business needed in a city would be done at a distance, where there was more room, and where on many accounts it could be done to more advantage. By the railroad the mechanic would be as near his customers four miles off, as he is now one third of a mile. From a centre of business a man might transport himself with great ease several miles for his food and lodging, since, as easily as he would walk up stairs, or up a hill, 22 feet, with two pounds weight in his hand, he could move forward a mile on a level railroad, transporting himself, whatever is his weight, and moving his car also weighing 480 lbs. Or, supposing that it is about as fatiguing to a man to walk at the rate of three miles an hour, as to work for that time with the strength of a laboring man, then, as easily as he could walk one mile to his lodgings or home, he could propel himself and car, weighing together 625 pounds, 4¾ miles on a level railroad, and in the same time that he could walk a third of a mile. In the country an immense advantage would accrue from light and cheap railroads to centres of business, to get to stores, to physicians, to schools, to public lectures, and meetings, and to religious assemblies.

The influence of such means of communication on intellectual, moral, and religious improvement, I would set above all other advantages. The greatest mental and moral debasement is found in remote country neighborhoods, and in dark city lanes, and and their deep cellars.

4. The position of places of business is ordinarily such that they can be accommodated to a great extent by level railroads. Cities are commonly built on navigable waters; and the business in them is done along a water line, and here are ranged the workshops and stores. Railroads from the country will naturally terminate on this level, for they must be kept on low ground, and in the vallies of streams, which keep the lowest and most level courses. The railroads from Providence and Worcester terminate in Boston at what was once the neck, from whence very level rail paths might extend to the principal wharves, and indeed around the whole city. Rail tracks, extending from the termination of these railroads over the city, would greatly promote the success of the railroads, for, on a level track, a horse might draw several cars and loads, weighing together 12 tons. A car might receive the passengers directly from the steamboat, or travellers might enter one at their hotel, and without being delayed by the long process of getting seated at the head of the railroad, the cars, all loaded, might meet almost at the minute from different quarters, and pursue their course without hindrance.

Slight and cheap lines of railroad for the application of human power, intersecting the city and country, will accommodate especially the great body of the middling and poor classes, and may thus do as much good as the grand and heavy railroads, on which the ponderous cars of three and four tons weight are rolling; and they may add vastly to the business of these main channels of communication. If there are to be conveyed loads of 50, 100, 200, or 500 pounds, porters could convey them as easily on their light cars on rail tracks, as they could walk on a common road without any burden. To draw a load of 480 lbs. a man has to exert only the power that would raise two pounds over a pulley; and to move himself also on his load, he would have to exert only the additional tractive power of one third of a pound. The effect of cheap rail tracks would be as though a railroad terminated at each man's door.

By these facilities of communication, both the country and the town would be benefitted. Labor is nearly double in the city what it is in the country; and this is a loss to the laborer and the employer. It is a loss to the employer, because the labor he gets costs him so much; and it is a loss to the laborer, because his expenses are great and his accommodations poor. It is a loss also to the laborer in the country, because he cannot get the products of his labor to market without losing a great part of their value. The expense of transportation is a dead loss to the public; and by how much this expense is reduced, by so much is the whole public benefitted.

Publicola.

[For the Mechanics' Magazine.]

Locomotive Steam Engines.

The friends of the resolution for taking off the duties from locomotive steam engines, which was brought forward during the last session of Congress, urged in support of that measure the incompetency of the workshops of this country to supply the demand, and the inferiority of American locomotive engines.

It may be interesting to some of your readers to learn how little this argument is supported by the facts of the case. In a visit to the workshop of Mr. M. W. Baldwin, of Philadelphia, from which I have just returned, I collected the following information: Mr. B. has delivered from his workshop, within the last twelve months, ten locomotive steam engines, has six now in his shop in a state of great forwardness, some of which are nearly completed, and has contracts on hand for about twenty engines, for the following roads, viz.: the Columbia, Pa., State Road; the Trenton, the Newark, the Jamaica, the Troy and Saratoga, and the Utica and Schenectady roads. Under his present arrangements, he informed me that he gives employment to about 150 persons, and is able to complete an engine about every three weeks; and, to meet the increasing demand, is erecting workshops which will accommodate 300 hands.

As regards the character of these engines, there are seven of them at work on the Pennsylvania State road, upon which they have also two English engines, from the workshop of their most celebrated maker, R. Stephenson.

The engineer who has charge of the lo-

comotive department on this road, informed me that the power of the American engines is about 35 per cent. greater than that of the English, and that the loss of time, and cost for repairs, is *altogether in favor of the American engines:* five hands, as he stated, having been sufficient to keep all the seven in order.

For the gratification of such of your readers as are interested in railroads, I will refer to the principal points of difference between the English and American engine, and what I conceive to be the peculiar advantages of the American engine.

It is well known, that the crank-shaft, and the wheels, of the locomotive engine, have been by far the most troublesome and expensive part of the machine to be kept in repair. By the improvements in Mr. B.'s engine, these difficulties have been obviated, as has been proved by experiment. Of the 7 engines on the state road, and 2 on the Trenton road, some have been at work since the 1st of July last, and in no instance has a crank broken, or worked loose, or any of his improved wheels failed, or given trouble.

It is here proper to observe, that the Pennsylvania road is almost a continued series of curves, ranging from 500 to 700 feet radius, and so severe is it upon the wheels of an engine, that one of the English engines, (the other having been out of repair most of the time,) has within 2 months used up or destroyed a part of the wheels of both engines, and is now using a set of Mr. Baldwin's wheels.

The other improvements affect the force-pump, eccentrics, and reverse gear, all of which are so much simplified that the joints and working parts are not more than half as numerous as in the common English engine. The steam pipes have all ground metallic joints, and no cement or soft solder is used in any of the joints of the engine.

Another very important improvement has been added, by which the adhesion of the driving wheels may be increased at will, from 35 to 50 per cent. By this means, one of these engines, with only 6487 lbs. on her driving wheels, as a fixed weight, has carried a gross weight of 80 tons up an inclination nearly two miles in length, of 35 feet per mile ascent, without any perceptible slipping of the wheels.

The great object of the whole of these improvements has been to strengthen the weak points in the machine, and to simplify and reduce the number of its parts; and so fully has this object been accomplished, that this engine may justly be considered the most perfect of its kind now in use.

A Friend to American Manufactures.
New-York, June 16, 1835.

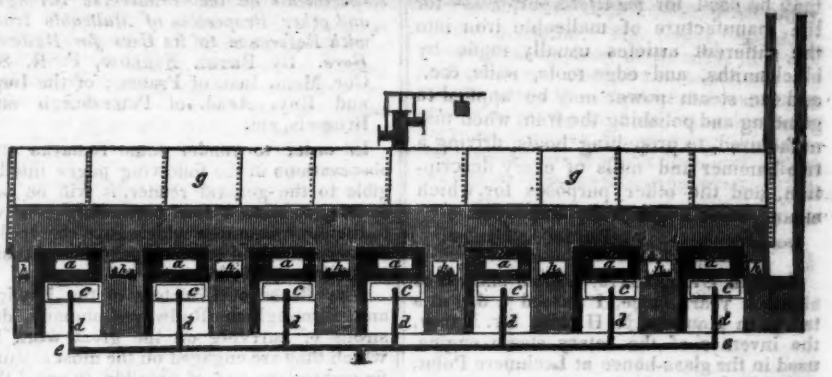
We have been favored by Mr. Clute, of Schenectady, with the annexed specification and engraving of his improved furnace.

References—*a a*, apertures for iron; *b b*, grates; *c c*, receivers; *d d*, branches of main blow-pipe; *e e*, main blow-pipe; *g g*, cylinder boiler; *h h*, apertures for coal.

Specification of a Patent granted to Peter I. Clute, *of Schenectady, New-York, for an Improvement in the Process of generating Heat, for forging Malleable Iron, and generating Steam to propel Machinery.*

Be it known, that I, Peter I. Clute, of the city of Schenectady, in the county of Schenectady, and state of New-York, have invented a new and useful improvement in the art or process of generating heat for forging malleable iron, and of generating steam to propel machinery for the purpose of grinding and polishing iron when manufactured, and for the other purposes for which steam power is generally employed.

IMPROVED PROCESS OF GENERATING HEAT AND STEAM.



The following is a description of the construction and operation of the furnaces and apparatus to be used in my invention.

Where other than a cylinder boiler, or where more than one boiler, is designed to be used, a given number of furnaces of the description hereinafter set forth, are to be erected under the same, arranged in the most convenient form, to receive as many points of the boiler or boilers, as, according to the principles hereinafter laid down, may be deemed most expedient; as, for example, in a circular form.

The *cylinder* boiler, however, I deem best adapted to the contemplated purposes of my invention.

Where the cylinder boiler is used, the number and size of the furnaces will vary according to the size of the boiler, and the quantity of steam required to be raised. The furnaces are to be built in a straight line, of uniform width and height, equidistant and continuous, the boiler to be laid horizontally or lengthways on the top of the furnaces. There is an aperture at either end of each furnace, through which the coal is shoved on the grate, and the fires fed as occasion requires. Under each grate there is a box, which I shall designate by the name of receiver, because it receives the blasts from the blow-pipe and the ashes falling through the grate. The receiver may be taken out and cleaned when necessary. Each receiver has at one of its sides an aperture for receiving a branch of the blow-pipe. There are, of course, as many branches to the main blow-pipe as there are furnaces, and the blow-pipe is connected with the bellows, which is worked by the steam the heat of the furnaces generates. The branch blow-pipe enters the receiver about at its centre, at a point equidistant from the grate and the bottom of the receiver, thus causing the wind in the receiver to circulate equally. There is an aperture near the top of the furnace, in front, through which to protrude the iron to be heated.

This aperture may be closed by a valve when not used.

Let the cylinder boiler be 20 feet long and 2½ feet in diameter; then there ought to be about seven furnaces, and the proportions of the different parts of the furnaces, &c., ought to be, as nearly as may be, as follows: Distance between the grate and the boiler, twelve inches; length of grate, eighteen inches; width of grate, eight inches; width of the furnace to correspond with the size of the grate; the aperture at either end, to admit the coal, to be 8 inches in width, and 6 inches in height; the receiver, 8 inches in width, and 6 inches in height; aperture for receiving the blow-pipe, 1½ inch in diameter; aperture through which to heat the iron intended to be worked, 6 inches in width, and three inches in height; distance between each grate, three eighths of an inch; diameter of blow-pipe, 4 inches, and diminished to one inch and a half at the entrance into the receiver.

The strength of the blast required is equal to that of a blacksmith's fire. The degree of heat may be regulated by valves placed in the blow-pipe.

I do not claim to have discovered or invented any thing new in the construction of the furnaces *abstractly* considered, or in any of the apparatus connected with the steam engine, nor can my invention in strictness be considered as an improvement of a machine or instrument previously patented; nor can it be considered an application of an old instrument or machine to a new purpose. What I claim as *new*, and my own invention, may be reduced to the following particulars:

1st, The using a number of furnaces to raise steam; 2d, the process of heating the boiler *uniformly* at many points, thus differing from the universal practice which now obtains, of heating the boiler at one particular point; 3d, the employing the same steam raised by the furnaces in driving the bellows connected with these furnaces; 4th, the application of the blow-pipe to ignite anthracite coal for raising steam; 5th, the using the same fire for the double purpose of raising steam and heating and working malleable iron.

I consider these two last particulars the most important, and as in especial manner distinguishing my invention from every other. This apparatus possesses a highly important advantage, in that it

may be used for *manifold* purposes—for the manufacture of malleable iron into the different articles usually made by blacksmiths, and edge tools, nails, &c., and the steam power may be applied to grinding and polishing the iron, when manufactured, to propelling boats, driving a trip-hammer and mills of every description, and the other purposes for which steam power is generally employed.

PETER I. CLUTE.

AERIAL STEAMBOATS.—Some sixteen or eighteen years since, I passed a day at a tavern in Hanover, N. H. with Mr. Maury, the inventor of the rotary steam engine, used in the glass-house at Lechmere Point, and who has made numerous experiments on light, heat and combustion, and in various branches of mechanics. He stated that he should live to see the mail transported by carriages, propelled by steam, between our largest cities, and the. I should live to see it carried in steamboats through the air. On expressing doubts of the practicability of the latter improvement, in the mode of transmitting intelligence, he went into a long argument to prove, that it was not only possible, but absolutely easy of accomplishment. It has been ascertained, he observed, that large weights can be elevated high above the earth, by balloons filled with air, lighter than that of the atmosphere. The first grand step, then has been securely taken, and it is only necessary to apply a power which shall give the balloon a horizontal motion, when a rudder can be applied to guide it, and this can be done by a steam engine, working paddle-wheels as in a steamboat on our waters, but each of the paddles to move on an axis so as to offer no resistance, after having struck the air in one direction. The balloon must be constructed in the form of a fish, or in other words, have length, and such a structure as will be most easily propelled and guided, while space is afforded for the machinery and passengers. He had estimated the requisite size of a steam aerial boat to sustain an engine capable of propelling it sixty miles an hour. After many details, this intelligent, ingenious, and sanguine gentleman, closed his remarks with this bold and prophetic declaration, "You, sir, if you live to the common age of man, will see aerial steamboats rise up out of our large cities every morning, like a flock of wild geese, and take their several directions to the various parts of the Union, laden with the mails and passengers."

Notwithstanding the doubts which are generally entertained of the ultimate benefit to be derived from balloon experiments, a very scientific man, many years since, did foretell the establishment of railroads, and may not be mistaken as to the aerial ocean being successfully navigated. It would not be more wonderful than was the first steamboat which the illustrious Fulton launched upon the Hudson, or the sight of the first locomotive, which sped like the wind from Liverpool to Manchester.—[Boston Atlas.]

ELASTIC MARBLE.—From the quarries in Berkshire county, Mass., are obtained specimens of elastic white marble, of a beautiful texture, and susceptible of a high polish. If there are other localities, thay have not been very distinctly recorded. Supported at the two extremities, the slabs spring like a board placed in a similar position, though the bending is much less. Mineralogical cabinets should all be furnished with samples of this singular stone. — [Scientific Tracts.]

Experiments on the Transverse Strength and other Properties of Malleable Iron, with Reference to its Uses for Railway Bars. By PETER BARLOW, F. R. S., Cor. Mem. Inst. of France; of the Imp. and Roy. Acad. of Petersburgh and Brussels, etc.

In order to render some remarks and observations in the following pages intelligible to the general reader, it will be necessary to state a few particulars relative to the circumstances which gave rise to the experiments, and to the appearance of them in their present form.

The Board of Directors of the London and Birmingham Railway Company, desirous of carrying on the great work in which they are engaged on the most scientific principles; and, if possible, to avoid the enormous cost of repairs which has attended some large works of a similar description, offered, by public advertisement, a prize of one hundred guineas "for the most improved construction of railway bars, chairs, and pedestals, and for the best manner of affixing and connecting the rail, chair, and block, to each other, so as to avoid the defects which are felt more or less on all railways hitherto constructed;" stating, that their object was to obtain, with reference to the great momentum of the masses to be moved by locomotive steam engines on the railway,

1. "The strongest and most economical form of rail.
2. "The best construction of chair.
3. "The best mode of connecting the rail and chair; and also the latter to the stone blocks or wooden sleepers. And that the railway bars were not to weigh less than fifty pounds per single lineal yard."

In consequence of this advertisement, a number of plans, models, and descriptions were deposited with the company within the time limited by the advertisement; and others were received afterwards, which, although not entitled to the prize, were still eligible to be considered with reference to their adoption for trial. On the 24th of December last, a resolution was passed at a meeting of the Directors, appointing J. U. Rastrick, Esq., of Birmingham, N. Wood, Esq., of Newcastle, Civil Engineers, and myself, to examine and report upon the same, with a view to awarding the prize; and, at the same time, we were requested to recommend to the Directors such plans, whether entitled to the prize or not, as might be considered deserving of a trial. We met accordingly in London; and, after a long and careful examination of the several plans, drawings, and written descriptions, recommended those we thought entitled to the prize, which was awarded by the Directors accordingly. But that part of our instructions which required us to recommend one or more rails for trial, we were unable to fulfil to our satisfaction, principally for want of data to determine which of the proposed rails would be strongest and stiffest under the passing load, and whether permanently fixing the rail to the chair, for which there were several plans, would be safe in practice. No experiments on malleable iron having ever been made bearing on these points, it was considered better to leave the question unanswered, than to recommend, on no better ground than mere opinion, an expensive trial, which might ultimately prove a failure.

Seeing, however, how desirable it was that such data should be obtained, I proposed to the Directors to undertake a course of experiments, which should be conducted on a scale adequate to the importance of the subject, provided my Lords Commissioners of the Admiralty would allow me the conveniences His Majesty's Dockyard at Woolwich afforded, (which I had every reason to hope they would do, from the liberality I had so frequently experienced from that Board on similar occasions,) and that the Directors would supply such instruments, materials and workmanship, as might be required for the purpose.

The Admiralty, as I had anticipated, immediately granted my request; and at a public meeting of the proprietors, held at Birmingham, a resolution was passed embodying my proposition. I accordingly commenced, and continued my experiments, till I had elicited such facts as I thought necessary; and having arranged them, as in the following pages, I delivered the results, with a report founded upon them, to the Secretary of the London Committee, to lay them before the Board; which being done, the Directors were pleased to express their high approbation of my labors, and their wish that the results should be made public. I have been, therefore, induced to print them in their present form, introducing only such foot notes as seemed to me necessary to render the subject intelligible to the general reader. I have given, also, in addition, the solution of one or two equations, which, to avoid embarrassing the report, had been suppressed, the results only having been stated.

Such are the circumstances under which the following pages have been submitted to the press; and they will serve to account for the form in which the subjects are arranged, which would probably have been different, if the publication in a separate work had been anticipated in the beginning. I have no doubt, however, if the facts elicited be found useful, the form and arrangement will be considered matters of secondary consideration.

PRELIMINARY REMARKS.

It is only since the very general adoption of railways in this country, that malleable iron has been employed to any extent to resist a transverse strain, and writers who have undertaken experiments to investigate the strength of materials, have hitherto passed over those inquiries which relate to the transverse strength of this metal.* The extraordinary extent, however, to which malleable iron is now applied to resist transversely a passing load, renders it highly essential that this resistance, and its other properties, should be fully investigated; for it is obvious, that every additional weight of metal, beyond that which is requisite for perfect safety, is not only uselessly, but injuriously employed, it being generally admitted that bars beyond a certain weight cannot be so well manufactured as those of less dimensions; and it is no less certain, that by a proper disposition of the metal in the sectional area of the bar, (which depends on the data in question,) a greater strength may be obtained with a given weight of iron, than with a greater weight injudiciously disposed. Under these impressions, the following experiments have been undertaken, and to these inquiries only

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* Some few experiments on the transverse strength of malleable iron have certainly been made. I have given three in my Essay on the Strength of Materials. Mr. Hodgkinson has also glanced at this subject in his valuable paper of Experiments on Cast Iron, published in the Memoirs of the Manchester Philosophical Society, and M. Duleau has treated of the subject in his "Essai Theorique et Experimental," &c.: but those points of greatest importance connected with the application of this metal to the purposes of Railways have never formed the subject of inquiry.

they have been directed; and I am not without hope that on those points they may be found useful.

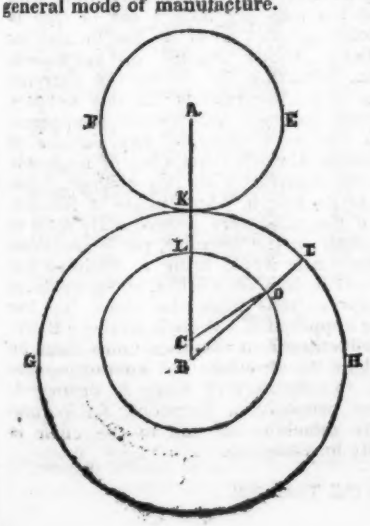
Before, however, proceeding to these experimental researches, there is one subject, rather of investigation than of experiment, on which I have thought it necessary to bestow some attention, it being one on which the opinions of practical men are much divided; this is, the comparative advantages and disadvantages of what is called the fish-bellied rail, and that with parallel edges.

Examination of the Properties, Curvature, and Resistance, of the Fish-bellied Rail.

It is well known, both as a theoretical and mechanical fact, that if a beam be fixed with one end in a wall, or other immovable mass, to bear a weight suspended at the other end, the longitudinal section of such a bar (its breadth being uniform) should be a parabola; because, with that figure, every part of it will be strong in proportion to its strain, and thus one-third of the material may be saved. This form of construction is frequently adopted in the case of cast-iron beams in buildings, and with great advantage, as thereby one-third of the material is saved, while the strength is preserved, and the walls of the building relieved from a great unnecessary weight.

This seems to have led to a somewhat similar principle of construction in what is called the fish-bellied rail; and the question here is, with what advantage? In the first place, it is to be remarked that the figure, which theory requires in this case, is not, as in the preceding, a parabola; for, as in the transit of the locomotive, every part of the bar has, in succession, to bear the weight; and as the strain on any part of a beam supported at each end, and loaded in any part of its length, is as the rectangle of the two parts,—the strength being as the square of the depth,—it follows that the square of the depth ought to be every where proportional to the rectangle of the two parts, which is the known property of a semi-ellipse. The bar, therefore, in theory, ought to be a semi-ellipse, having its length equal to the transverse diameter, and the depth of the beam for its semi-conjugate, and there can be no doubt, that such a figure would be, to all intents and purposes, as strong in its ultimate resistance as a rectangular beam.

But it is difficult to obtain this figure correctly in malleable iron, and many of what are called fish-bellied rails are but bad approximations to it, although others differ from it but slightly. The following is the general mode of manufacture.



EF is the section of an iron roll; GH the section of another. This latter being hung on a false centre C, is turned down, leaving a groove of varying depth as shown in the figure. The cylinder GH being now again placed on its proper centre B, the bars are introduced between the two rolls at KL; and as the iron passes through, it acquires the variable depth shown in the lower roll. The inner circle, or bottom of the groove, is generally one foot in diameter, and the upper three feet in circumference; consequently, the figure is completed in a length of three feet, and there are commonly five such lengths in a bar. The computation of the ordinates to the curve thus formed is by no means difficult; for, calling the radius of the cylinder CD=r, and the distance of the centres BC=d and x any angle LCD, we find the ordinate.

$$ID=BI-\sqrt{(r^2+d^2-2rd\cos.\ x.)}$$

And by this formula the ordinates of the curves have been computed for two different fish-bellied rails; the extreme depth in both being five inches, but the lesser depth in one three inches, and in the other three and three-quarter inches, the latter being that proposed by Mr. Stephenson for the London and Birmingham Railway. The ordinates are taken for each 10°, or for every inch of the half-length, and in the last column are given the ordinates of the true ellipse.

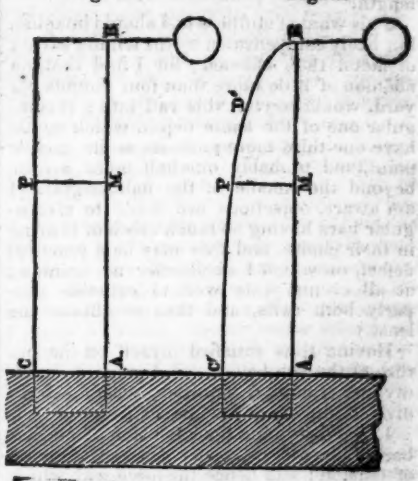
TABLE OF ORDINATES.

ABSCISSES.	Ordinates in Fish-bellied Rail. Greatest depth 5 in, Least do. 3"	Ordinates in Mr. Stephenson's Rail.	Ordinates in the Ellipse.
Deg. In.			
0 = 0	3·00	3·75	0
10 or 1	3·01	3·76	1·64
20 " 2	3·05	3·78	2·29
30 " 3	3·12	3·82	2·76
40 " 4	3·21	3·88	3·14
50 " 5	3·31	3·95	3·46
60 " 6	3·44	4·04	3·72
70 " 7	3·59	4·14	3·96
80 " 8	3·75	4·23	4·16
90 " 9	3·92	4·34	4·33
100 " 10	4·09	4·45	4·48
110 " 11	4·27	4·55	4·61
120 " 12	4·43	4·66	4·71
130 " 13	4·59	4·75	4·80
140 " 14	4·72	4·84	4·87
150 " 15	4·84	4·91	4·93
160 " 16	4·93	4·95	4·97
170 " 17	4·98	4·99	4·99
180 " 18	5·00	5·00	5·00

We see by this table, (although it is impossible, with any proportions or degrees of eccentricity, to work out a true ellipse by this method,) that we may approximate towards it sufficiently near for practical purpose, as Mr. Stephenson has done; while, on the other hand, without due precaution, we may so far deviate from it as to render the bar dangerously weak in the middle of its half-length.

As far as relates to ultimate strength, there can be no doubt Mr. Stephenson's rail is equal to that of an elliptic rail, and consequently to that of a rectangular rail of the same depth; but there is still an important defect in all elliptical bars, viz., that although this form gives a uniform strength throughout, it is by no means *so* stiff as a rectangular bar of a uniform depth, equal to that of the middle of the curved bar, and it is the stiffness rather than the strength that is of importance; for the dimensions of the rail must so far exceed those which are barely *strong enough*, as to put the consideration of ultimate strength quite out of the question. The object, therefore, with a given quantity of metal, is to obtain the form least affected by deflection; and unfortunately the elliptical bar, although equally as strong as the rectangular bar of the same depth, as far as regards its ultimate resistance, is much less stiff. This will appear from the following investigation.

Fig. 1. Fig. 2.



The deflections which beams sustain when supported at the ends and loaded in the middle, is the same, as the ends would be deflected, if the beams were sustained in the middle, and equally loaded at the ends, each with half the weight; and the *law* of deflection is the same in the latter case, as when the beam is fixed in a wall and loaded at its end, although the *amount* is greater. At present, however, our inquiry is not the actual, but the relative deflection in two beams, one elliptical, and the other rectangular, of the same length, and of the same extreme depth—the breadth and load being also equal in each. It is quite sufficient, therefore, to consider the corresponding effects on two half-beams, each fixed in an immovable mass, as represented in the preceding figures.

Now, in the first place, the elementary deflection at C is the same in both beams, because the lengths and loads are the same, and the depths at C A equal; but the whole deflection at any other point P, will be directly as M B^2, and inversely as M P^3. If, therefore, we call M B=x, and M P=y, the sum of all the deflections in the two beams will be $\int\frac{x^2}{y^3}.\ d\ x\ \triangle$, $\triangle$ being the sine of deflection at C. But in fig. 1, y is constant and equal to d, (the depth,) while in the latter,

$$y=\frac{d}{l}\sqrt{(2\,l\,x-x^2)}$$

l being the semi-transverse or length, and x any variable distance.

The whole deflections, therefore, in the two cases, are,

Fig. 1:—

$$\text{Deflection}=\int\frac{x^2\ dx}{d^3}\triangle=(\text{when } x=l)$$

$$\frac{1}{3}\frac{l^3}{d^3}\triangle$$

And in fig. 2:—

$$\text{Deflection}=\int\frac{x^2\ dx\ \triangle}{\frac{d^3}{l^3}(2\,lx-x^2)^{\frac{3}{2}}}=(\text{when } x=l)$$

$$.41\ \frac{l^3}{d^3}\triangle$$

The deflections, therefore, in the two cases are, with the same weights, as 33 to 41,* or nearly as 3 to 4, a result fully borne out by subsequent experiment. It is to be observed, also, that this investigation applies only to the deflection when the weight is in the middle of the bar, and that it would be much greater in comparison with the parallel rail towards the middle of its half-length.

This want of stiffness is, I should imagine, but badly compensated by the trifling saving of metal thus effected; for I find that an addition of little more than four pounds per yard, would convert this rail into a rectangular one of the same depth, which would have one-third more stiffness at its middle point, and probably one-half more a little beyond the middle of the half-lengths. I am aware, objections are made to rectangular bars having so much depth of bearing in their chairs, and this may be a practical defect, on which I shall offer no opinion; at all events, it is well to estimate properly both evils, and then to choose the least.†

Having thus satisfied myself on the nature of the fish-bellied rail, I proceeded with my experimental inquiries, which I have divided into the following sections:

1. To determine the extension of an iron bar of given area, under different degrees of tension; and hence the force with which the same bar will contract with a given reduction of temperature.

2. The comparative resistance of malleable iron to extension and compression, and thereby the position of the neutral axis.

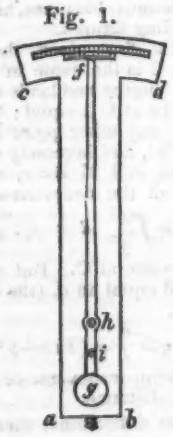
3. The figure of the area of section, which gives the greatest strength with the same quantity of metal.

4. The strains which bars of given sections are capable of sustaining without injury to their elastic power.

Experiments to determine the quantity which iron extends under different degrees of tension.

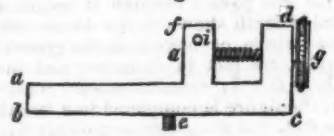
With a view to this inquiry, an instrument was made as in the annexed

Fig. 1.

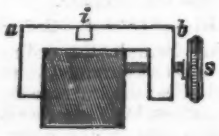


sketch. *a b c d* is a piece of brass, about one-fifth of an inch thick, having an arc at top, divided into tenths of inches; *h f g* is a hand, with a vernier, turning freely on a centre *h*; and *i* is a steel pin, about half-an-inch long, projecting perpendicularly forward; the distances *f h* to *h i* being as 10 to 1. *e* is a small end with a screw, for the purpose described below. *a b c d* is another

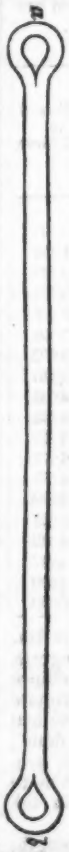
Fig. 2.



piece of brass, having a screw *e*; *f* is a piece working in a dove-tail, adjustable for position by the screw *g*, and *i* is another steel pin projecting forward. *a b* is an iron



saddle-piece, with a set screw *s*; and at *i* a hole is tapped to receive the screw *e*, fig. 2; and another saddle piece, exactly like this, is made to receive the screw *e*, of fig. 1.



The iron bars intended to be experimented on were made of the annexed form, about ten feet in length; these, by proper bolts and sheckles, were fixed at *a* and *b* in the proving machine;* the two saddle pieces were then fixed on at the exact distance of 100 inches; the instruments, fig. 1 and 2, screwed into their respective saddle pieces, and a light deal rod hung, by means of two small holes formed in it, (also at the distance of 100 inches,) upon the two pins *i i*; and then by means of the set-screw, fig. 2, the vernier of fig. 1 was adjusted exactly to zero. The pump of the hydraulic press was now put in action, and after one, two, or more tons pressure were on, according to the size of the bar, and every thing brought well to its bearing, the hand was again adjusted to zero, after which the index was read for every additional ton. Here it will be seen, that whatever the bar stretched between the two instruments, the lower pin of fig. 1 was drawn forward, and the index-end thrown back ten times that amount, consequently to ten times the actual amount of the quantity stretched.

It has been observed, that after one, two, or more tons strain were applied to bring every thing well to its bearing, the index was adjusted to zero, and its reading afterwards carefully registered as each additional ton was added. The strain during the experiment was repeatedly let off, and the index was found to return to zero, till the strain amounted to about nine or ten tons per inch, when the stretching became greater for each ton, and the bar did not any longer regain its original length when the strain was removed, its elasticity with this tension being obviously injured.

These experiments required more attendance than it was possible for one person to give; the adjustment of the weights, the reading and registering the index, required each the undivided attention of one individual; the pumping also required to be watched with care. And I have great pleasure in acknowledging the ready assistance I received from Messrs. Lloyd and Kingston, the Engineers of the yard; from Mr. P. W. Barlow, Civil Engineer; as also from Lieutenant Lecount, who came from Birmingham to witness and assist in the experiment.

Collecting the results of these seven experiments, (see opposite page,) and reducing them all to square inches, we find that the strain which was just sufficient to balance the elasticity of the iron, was in—

Bar, No. 1.	(re-manufactured iron)	10	tons.
" 2.	ditto	11	"
" 3.	New Bolt	11	"
" 4.	ditto	10	"
" 5.	(re-manufactured)	9.5	"
" 6.	ditto, from old furnace bars,	8.25	"
" 7.	New bar, by Messrs. Gordon,	10	"

We may consider, therefore, that the elastic power of good iron is equal to about ten tons per inch, and that this force varies from ten to eight tons in indifferent and bad iron. It appears, also, (considering ·000096 as representing in round numbers $\frac{1}{10000}$th,) that a bar of iron is extended one ten-thousandth part of its length by every ton of direct strain per square inch of its section; and consequently, that its elasticity will be fully excited when stretched to the amount of one-thousandth part of its length.

Remarks on the foregoing Experiments.

These results have an important bearing on the question of railway bars. We shall see, in the following section, how they become applicable to the investigation of the transverse strain; but, at present, I shall only speak of them as they apply to the fixing of the rail to the chair. Amongst the numerous models which the Directors did Messrs. Rastrick, Wood, and myself, the honor to submit to our inspection, for the purpose of awarding their prize, there were several in which it was intended to fix the rail permanently to the chair — a very desirable object, if it could have been safely adopted; and it was the want of data to enable us to decide on this point, which first led me to propose this course of experiments. The question is now satisfactorily answered. We have seen that, with about ten tons per inch, a bar of iron is stretched $\frac{1}{1000}$th part of its length, and its elasticity wholly excited or surpassed. Again, admitting 76° to be the extreme range of the thermometer in this country between summer and winter, it appears, from the very accurate experiments of Professor Daniell,* that a bar of malleable iron will contract with this change $\frac{1}{2000}$th part of its length. And hence it follows, that if the rails were permanently fixed to the chair in the summer, the contraction in the winter would bring a strain of five tons per inch upon the bar, and a strain of twenty-five tons upon the chair, (the bar being supposed of five-inch section,) thereby deducting from the iron more than, or full half, its strength, and submitting the chair to a strain very likely to destroy it. Every proposition, therefore, for permanently attaching the rail to the chair is wholly inadmissible.

* Experiments have been made from which it has appeared that the fish-bellied rail was stiffer than the parallel rail, which is certainly possible, if the parallel rail be of inferior metal or of injudicious figure; but it is mechanically impossible if the parallel bar be made of the figure here assumed.

† It will be seen in a subsequent page, that by introducing what is called a lower web, that weight for weight, a parallel rail may be made as strong as the fish-bellied, with only an additional depth in the chair of three-quarters of an inch.

* The Lords Commissioners of the Admiralty having been pleased to allow me any facilities His Majesty's Dock-yard at Woolwich afforded for conducting these experiments on a proper scale, the proving machine here referred to is an hydrostatic press, constructed by Messrs. Bramah's, principally for the purpose of testing or proving the iron cables, before they are issued for service. It is an excellent machine of its kind, is capable of bearing a strain of 100 tons and is very sensible to a difference of strain of 1-8th of a ton.

* See Phil. Trans. 1831.

Experiments on the Longitudinal Extension of Malleable Iron Bars, under different Degrees of direct Tension.

TABLE I.

Bar No. 1, 1 inch square. February 21st.			Bar No. 2, 1 inch square. February 21st.		
Weight in Tons.	Index Readings.	Parts of the whole Bar extended by each Ton.	Weight in Tons.	Index Readings.	Parts of the whole Bar extended by each Ton.
2	zero		2	zero	
3	·0625	·0000625	3½	·11	·0000733
4	·156	·0000935	4	·15	·0000800
5	·265	·0001090	5	·24	·0000900
6	·375	.0001100	6	·35	·0001100
7	not observed	mean.	7	·44	·0000900
8	·562	·0000935	8	·52	·0000800
9	not observed	mean.	9	·62	·0001000
10	·750	·0000940	10	·70	·0000800
11	·875	·0001250	11	·81	·0001100
			12	1·13	{ Elasticity injured. }

Bar No. 3, 1 inch diameter. February 23d.			Bar No. 4, 1 inch diameter. February 23d.		
Weight in Tons.	Index Readings.	Parts of the whole Bar extended by each Ton.	Weight in Tons.	Index Readings.	Parts of the whole Bar extended by each Ton.
1	zero		1	zero	
2	·16	·0001600	2	·15	·0001500
3	·31	·0001500	2	·28	·0001300
4	·44	·0001300	4	·42	·0001400
5	·56	·0001200	5	·56	·0001400
6	·67	·0001100	6	·69	·0001300
7	·79	·0001200	8	·79	·0001000
8	·91	·0001200	7	·97	·0000800
9	·103	·0001200	9	·116	{ Elasticity destroyed }

Mean extension per ton, per square inch,

Bar No. 1.	·0000982
No. 2.	·0000903
No. 3.	·0001010
No. 4.	·0000976
Mean of the four	·0000967

TABLE II.

Bar No. 5, 2 inches square. February 28th.			Bar No. 6, 2 inches square. February 28th.			Bar No. 7, 2 inches square. March 7th.		
Weight in Tons.	Index Readings.	Parts of the whole bar extended by each 4 tons.	Weight in Tons.	Index Readings.	Parts of the whole bar extended by each 4 tons.	Weight in Tons.	Index Readings.	Parts of the whole bar extended by each 4 tons.
4	zero		4	zero		4	zero	
6	·100		6	·090		6	·065	
8	·180	·000180	8	·150	·000150	8	·125	·000125
10	·240	·000140	10	·210	·000120	10	·175	·000110
12	·290	·000110	12	·250	·000100	12	·230	·000050
14	·350	·000110	14	·290	·000080	14	·280	·000050
16	·400	·000110	16	·335	·000085	16	·335	·000050
18	·450	·000110	18	·375	·000080	18	·385	·000105
20	·500	·000100	20	·410	·000075	20	·435	·000100
22	·550	·000100	22	·445	·000070	22	·480	·000095
24	·600	·000100	24	·485	·000075	24	·530	·000095
26	·650	·000100	26	·525	·000080	26	·575	·000095
28	·695	·000095	28	·565	·000080	28	·625	·000095
30	·740	·000090	30	·620	·000095	30	·670	·000095
32	·790	·000095	32	·660	·000095	32	·715	·000090
34	·825	·000085	34	·730	·000110	34	·755	·000085
36	·860	·000075	36		{ Full elasticity. }	36	·805	·000090
38	·920	·000095	38			38	·850	·000095
40	1·05	·000145	40			40	·900	·000095
		{ Elasticity exceeded. }						{ Elasticity perfect. }

Mean extension per ton, per square inch,

No. 5.	·0001082
No. 6.	·0000957
No. 7.	·0000841
Mean	·0000946
Mean of preceding Table	·0000967

These remarks may also be carried still farther. If it be dangerous to attach the rail *directly* to the chair, it must be bad in practice to affix it *indirectly* by wedges, cotters, or otherwise, beyond what is absolutely essential to give it steadiness under the passing load; for it is evident, that if by these means we could prevent any motion taking place, we should fall into the same evil as by the permanent attachment; and if, as most probably will happen, we fail of entirely accomplishing this, still all the friction which is produced must be overcome by the contracting force of the iron, and be so much strength deducted from its natural resisting power.

(To be continued.)

Ice and Ice Houses.—It is quite warm enough at this present writing to discourse of ice, but whether it will be when the types are giving publicity to the labors of the pen, depends entirely upon the future, which may be noted as a very wise remark. We intend, however, to say a few words of ice and ice houses, that may interest the reader. There are persons younger than ourself who can remember when the only ice sold in Boston, was brought to the city in parcels of ten or fifteen pounds in the box of a market gardener's cart, and sold as a very great luxury at a corresponding price. There were then no ice houses in the vicinity, except a few, at gentlemen's country seats, and they were built under ground, and were of small capacity. Within the last twenty years the consumption has become so general and the cost is so small, that ice is no longer deemed a luxury, but one of the necessaries of life. The amount exported also from Boston to southern climates is incredible. The art of preserving the ice, is very simple, and in well constructed houses, there is scarcely any loss from dissolution, and it may be preserved for years. We rode out last winter, with Col. Metcalf, of Cambridge, to witness the process of filling one of his ice houses, on the borders of Mystic Pond in Medford, about six miles from the city. The ice house is built entirely above the ground, as is now the well approved custom, even in *tropical* climates. It is 85 feet long, 50 feet wide, and 25 feet posts, and holds nearly 3000 tons of ice. The house is built of pine boards, and the ice is protected from external heat by filling in the walls, which are a foot and a half thick, with the exhausted bark of tan pits—a non-conductor of caloric that has been found perfectly efficacious. The Mystic Pond Ice House is very happily located, being so situated that the ice may be discharged directly from the house into the boats of the Middlesex Canal, or the cars of the Lowell Railroad, and can therefore be brought to the city at much less expense and loss by waste, than from any other establishment. The pond itself is supplied with water from another pond just above it, which upper pond is fed by such abundant springs, that we are told it never freezes in the coldest season. The water, therefore, is of the purest and most limpid quality. Col. Metcalf has lately loaded with this ice a vessel for Rio Janeiro, and another for Bombay. He has also sent freights to Norfolk, Savannah, and other southern ports. It is transported on the canal, and hoisted on board the vessel by machinery, made for the purpose, with great facility.

The process of cutting the ice, getting it from the water, and storing it in the ice house, is ingenious, but simple. The ice house is built on the border of the pond, and one end projects over the water. At this end there are two openings or doors, which extend from the floor to the roof. When the ice has made to a sufficient thickness, say 15 inches, a spot is selected where it is of the purest, most transparent, and solid quality. It is then marked out into oblong squares, 21 inches wide by 3 1-2 feet long. At every 21 inches of width, a groove is ploughed, half an inch wide, and 4 or 5 inches deep, by a plough made for the purpose, and drawn by a horse; the ice is then sawed across, at a distance of 21 inches, and one series of blocks being removed, the rest is easily set loose by a staff with a broad, chisel-formed end, driven into the groove, and used as a lever. A canal of a corresponding width to the blocks, is then made from the place where the

ice is selected, to the house, and the blocks are pushed along with a staff to one of the doors, where it is received into an iron cradle and hoisted up to the requisite height, when a spring, which has prevented the block from falling off, strikes a projection, and being forced down, the ice slides into the house, and is there received by persons who push it into its place with a staff. From the commencement of the process to the end, the ice is never touched with the hands. The average weight of each block is about 400 pounds, and being all cut of the same form and proportions, they are packed much more closely in the ice-house, or in the hold of a vessel, than when cut out as formerly, with an axe, in a negligent manner.—[Boston Transcript.]

We are indebted, and would again acknowledge our obligation, to P. G. VOORHIES, Esq., for the following and a continued regular monthly statement of the range of the Thermometer in the interior of Louisiana. It must be interesting to those who, in other parts of the country, keep a register of its variations. The accompanying remarks must also be interesting.

Extract of a Letter, dated

AVOYLLE FERRY, on Red River, La., June 6, 1835.

Sir,—The prospects of our planters are flattering—our crops of cotton and corn are generally very promising at this time throughout our section of country.

Yours, &c.

P. G. VOORHIES.

METEOROLOGICAL RECORD, for the months of January, February, March, April, and May, 1835—kept at Avoylle Ferry, Red River, Lou. (Lat. 31° 10′ N., Long. 91° 59″ w. nearly,) by P. G. VOORHIES.

JANUARY.

Days.	Morn.	Noon.	Night.	Wind.	Weather.	Remarks.
1	42	64	62	calm	clear	all day
2	54	72	68	SW	cloudy	..
3	50	48	46	calm	..	..
4	32	48	42	N	clear	..
5	29	54	45	calm	..	heavy white frost
6	29	46	44	..	..	..
7	34	50	50	..	cloudy	rain all day and night
8	36	48	45	NE	..	all day
9	38	46	43	calm	..	..
10	37	55	56	SE	..	..
11	46	53	53	calm	..	rain all day
12	61	64	64	SE	..	rain & h'vy thunder in e.
13	48	62	68	W	clear	all day—Red river rising—wind high
14	52	64	69	SW	cloudy	rain all day
15	46	58	52	W	clear	all day
16	32	54	56	calm	..	..
17	44	66	62	SW	..	..
18	40	68	56	calm	..	..
19	33	63	54	E	..	heavy white frost
20	60	66	64	SE	cloudy	rain all day
21	54	65	58	N	..	evening clear
22	38	67	60	S	clear	white frost
23	49	65	62	calm	cloudy	rain
24	58	70	65	S	..	rain, and heavy thunder
25	62	72	67	calm	clear	all day
26	70	86	70	..	..	..
27	60	71	64	..	..	..
28	46	71	68	W	..	..
29	70	68	56	sw.high	cloudy	from 2 to 9 a. m., most vivid lightning & h'vy thunder, light showers
30	34	41	40	w.high	clear	morn'g—day cloudy—wind high all day, WNW
31	30	42	46	calm	..	all day.

FEBRUARY.

Days.	Morn.	Noon.	Night.	Wind.	Weather.	Remarks.
1	40	56	52	calm	clear	all day—Red river rising
2	49	66	65	..	..	foggy morning—clear day—rain all night
3	40	40	40	sw.high	.	all day—most extraordinary, all day equal!
4	24	40	39	calm	..	all day—rain at night
5	28	45	46	..	..	a white frost—cloudy evening—rain at night
6	47	46	44	..	cloudy	and rain—clear evening—wind N, high
7	24	29	26	N to NW	clear	all day—wind high
8	12	26	27	calm	..	all day—coldest ever known in this country
9	20	40	40	..	..	all day
10	29	44	42	..	..	—white frost
11	28	54	48	..	..	.. ..
12	32	58	50	..	..	.. ..
13	38	66	64	sw.high	..	.. .. light
14	49	68	68	S to W	cloudy	rain at night
15	34	40	42	W to NW	..	some spits of snow
16	31	44	42	calm	clear	white frost
17	29	54	52	..	..	..
18	34	64	60	..	..	..
19	45	70	64	..	..	..
20	49	65	66	SW	cloudy	
21	58	74	70	s.high	..	rain & h'vy thunder all n.
22	60	60	56	calm	..	.. .. all day
23	50	55	52	..	..	evening clear
24	46	59	58	..	..	morning—clear day
25	58	69	66	..	..	all day
26	50	37	36	N.high	..	rain, hail, and sleet
27	23	32	33	calm	clear	ground covered with ice
28	25	45	41	..	..	ice remains in the shade.

MARCH.

Days.	Morn.	Noon.	Night.	Wind.	Weather.	Remarks.
1	30	50	48	calm	cloudy	white frost
2	40	50	52	..	..	light drift'g showers all d.
3	51	67	63	S	..	light drifting showers—rained at night
4	42	38	39	NE.high	..	light drifting showers, and rain at night
5	34	39	42	N	..	rain, snow, and sleet
6	34	48	43	calm	clear	white frost
7	40	44	44	..	cloudy	rain all day
8	43	52	50	..	..	all day
9	46	54	52	..	..	evn'g wind N to NW, clear
10	44	58	50	..	clear	white frost
11	36	61	61	..	..	great flight of wild geese this morn'g to N
12	40	66	60	slight	.	all day
13	51	70	68	S	cloudy	..
14	62	76	73	s.high	..	..
15	68	73	71	calm	..	..
16	60	77	70	..	clear	night cloudy—sowed oats and red clover—began planting corn
17	58	58	54	NE	cloudy	rain at night
18	50	67	66	SE	..	rain in morn'g, ev'g clear
19	47	65	64	calm	clear	
20	59	71	67	SE	..	
21	68	78	65	s.high	cloudy	rain at night—a heavy gale from west all night
22	45	61	60	w.high	clear	wind high fm w. all day
23	38	59	58	calm	..	white frost
24	42	65	60	s.light	..	
25	58	69	64	S	cloudy	
26	62	70	66	calm	..	heavy thunder and rain in morning—day clear
27	45	74	70	..	clear	all day
28	48	80	66	S	..	..
29	50	76	72	calm	..	..
30	54	78	76	..	..	..
31	66	80	75	..	..	..

APRIL.

Days.	Morn.	Noon.	Night.	Wind.	Weather.	Remarks.
1	60	71	69	calm	cloudy	Red river rising
2	60	76	71	s.light	..	
3	61	75	68	calm	clear	
4	54	74	68	NE	..	smoky, pine woods on fire
5	44	67	61	calm	..	..
6	43	66	56	NE	..	foggy morning—day clear
7	44	65	61	NW.light	..	.. ..
8	45	72	72	calm	..	smoky
9	50	65	60	..	cloudy	.. —rain at night
10	50	72	66	..	clear	foggy morning—clear day
11	60	77	68	s.high	..	all day [river at a stand
12	66	73	70	s.light	cloudy	shower in the morning
13	56	68	63	NE	..	all day—river falling
14	57	61	56	N	..	..
15	52	58	50	NE	..	rain and showers all day
16	46	66	60	calm	clear	
17	44	70	64	SE	..	
18	60	61	63	..	cloudy	rain all day
19	71	71	69	s.high	..	drizzling all day
20	66	71	65	calm	..	.. ..
21	56	72	64	..	..	
22	58	72	72	..	..	
23	54	80	74	..	..	foggy morning
24	62	72	70	..	..	clear at noon
25	70	72	67	SE	..	thunder and rain all day
26	64	72	70	calm	..	
27	64	70	66	N	clear	Red river rising
28	50	72	68	calm	..	
29	58	68	70	SW	cloudy	rain and thunder all day
30	70	76	72	calm	clear	.. .. in even'g.

MAY.

Days.	Morn.	Noon.	Night.	Wind.	Weather.	Remarks.
1	68	64	63	NW	cloudy	heavy rains and thunder all day
2	58	78	76	calm	clear	
3	68	82	78	..	..	Red river falling
4	70	82	77	SW	..	
5	72	80	78	calm	..	
6	66	81	76	..	..	
7	71	80	77	SW	..	
8	72	84	79	SE	..	high wind
9	64	70	68	NW	..	.. .. —all day
10	60	69	64	calm	clear	Red river on a stand
11	66	82	78	..	..	
12	72	81	76	S	..	
13	74	83	80	..	..	
14	72	86	80	SW	..	
15	64	78	74	N	..	
16	60	77	70	calm	..	
17	58	80	73	..	..	
18	60	78	72	SE	..	light wind
19	71	78	76	..	cloudy	thunder storm at noon
20	71	83	80	calm	clear	cloudy evening—Red river rising
21	70	85	78	..	..	
22	70	83	80	SE	..	
23	70	84	80	calm	..	
24	70	84	75	S	cloudy	little rain and thunder in the evening
25	71	81	78	calm	clear	
26	69	83	78	..	..	
27	68	84	80	..	..	
28	70	84	79	..	..	
29	69	85	81	..	..	U. S. snag s. steamboats, Capt. Shrives, passed down fm. the rafts on Red river—left unfinished, 23 to 25 miles; 3 steamboats, 1 keel
30	68	86	83	S	..	
31	72	86	84	..	..	

Red river rose this month, 1 foot 0 inches—and is below high water mark, 5 feet 2 inches.

TELESCOPES.—In the county of Worcester, Mass., a self-taught optician resides, who has manufactured some of the best telescopic instruments ever exhibited in this country, so far as it regards distinct vision, under a very high magnifying power. Yet no one patronizes him, to the extent which his merit certainly demands. Every thing within the calibre of his telescopes is complete; and, indeed, all that the astronomer values most, is attained; but the exterior workmanship is rough, inelegant, and clumsy. This circumstance probably operates against them. People are so prone to be influenced by external appearances, that philosophers in rags are never made the companions of kings. A little more attention to this part of the business would certainly have a tendency to call the attention of the learned. At present, the tubes and stands are too abominably ugly.—[Scientific Tracts.]

A gentleman having occasion to manure a certain portion of land lately, the carts bearing the manure passed through a field that appeared one entire bed of common thistles. It was observed, that wherever the cart went, the thistles were entirely destroyed. He then rolled the whole field with a cast iron roller in the latter end of May, and twice in the beginning of June. This field has been perfectly free from thistles ever since. The expense was only three shillings per acre. Fern and closfoot have been exterminated in the same way with most complete success.—[Scottish Paper.]

BUTTER.—An observing farmer of this neighborhood told us a few days since, that about the first week in June, inst., his dairy yielded 74 pounds of butter; second week, 98 lbs. do.; third week, 72 lbs. do. Whence so much difference in the products? The same number of cows were milked each week, and they were pastured in the same field.—[Village Record.]

Fig. 1.

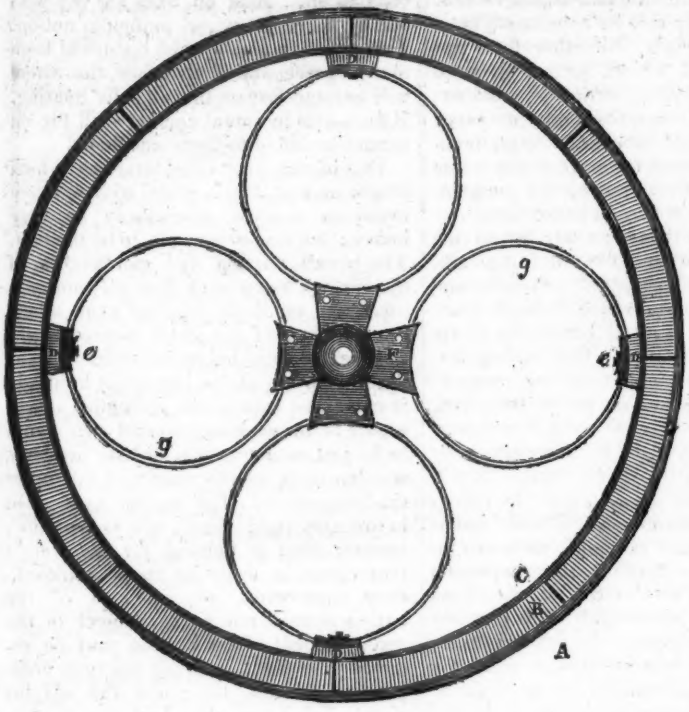


Fig. 2.

[From the London Mechanics' Magazine.]

ADAMS' CIRCULAR SPRING WHEELS.

"Break all the spokes, * * * * *
And bowl the round nave down."

It has long been a desideratum amongst mechanicians, to accomplish the task of constructing a wheel for carriages intended to convey persons and goods over rough roads, which, while it should possess sufficient strength fitly disposed in its several parts to resist breakage, unsteadiness, or any permanent alteration of form, from any of the ordinary shocks or violence to which it might be subjected, should yet possess the property of elasticity to such a degree, as to intercept and materially diminish the concussion caused by the periphery rolling over obstacles during its revolution; and thus either prevent the concussion from extending its effects to the axis round which the wheel might revolve, or to lessen it so much that the effects might be comparatively innocuous. It must, of course, be necessary that the elastic power should be placed between the periphery and the axis, without in any way diminishing the roundness or altering the circular form of the periphery—which circumstance would tend materially to increase the rolling friction of the wheel: wherefore the only mode in which elasticity can be made available, must be by enabling the axis to depart sufficiently from the exact centre of the periphery where concussion takes place—to which exact centre the elastic force, pressing equally in various opposite directions in the plane of the wheel, should have a constant tendency to restore it when the effect of the concussion might cease. The advantages attendant upon a wheel so constructed are several and obvious.

1st, In ordinary sized wheels, used for a cart without springs, the concussion from the road is driven in a direct line along the spokes of the axis; and this concussion, constantly kept up as the wheel revolves, serves materially to increase the weight of draught, by forcing out the oil or grease, and bringing the rubbing surfaces of the axis and axis-box in close contact, to the increase of friction. This disadvantage would be removed entirely, or very materially lessened, by the use of an elastic wheel.

2d, In carriages with rigid wheels, to which the axis is attached by means of a horizontal spring bearing on the axis, the concussion is diminished, by its uniform bearing upwards; still it is but slightly, inasmuch as the momentum of the concussion passes directly along the rigid spokes to the axis; and, moreover, the relief which the spring affords is only in a vertical direction; in which direction the greatest amount of the momentum of concussion does not pass, but in a direction more inclining towards the line of progress as the wheel revolves. This disadvantage would be materially lessened by an efficient elastic wheel, inasmuch as the elasticity being in a circle all round the axis, would avail both against vertical and horizontal obstacles or inequalities.

3d, It is well known that the force requisite to move a carriage at first starting is greater than that required to keep motion up. The reason of this is, that momentum is required in proportion to the rapidity of the motion. Wherefore, every obstacle or inequality which the wheel encounters as it revolves, has a tendency to check the momentum, and render the draught power necessary to move the carriage onwards nearer in amount to that which was originally required to move it from a state of rest; because the concussion in the line of progress is nearly in direct opposition to the momentum, and serves to neutralize it. An efficient elastic wheel would be found to receive the concussion on its periphery, but as it would not carry it, or would carry it with a diminished force, to the axis, the momentum of the superincumbent framework, to which the draught power is attached, would scarcely be acted on by it.

4th, The wheels of carriages are subject to considerable concussion in a lateral direction, lengthwise of the axis. A rigid wheel, under such concussion, transmits the concussion almost unbroken to the carriage, to the annoyance of the passengers, and with a tendency to derange the framework. But an efficient elastic wheel would possess a small portion of lateral elasticity, sufficient to diminish the violence of the concussion, and yield greater ease of motion.

5th, An elastic wheel, by its tendency to elude concussion rather than to resist it, will be less liable to be broken or strained than one which is rigid, and consequently its total durability is likely to be much greater. Wooden wheels, by reason of their property of elasticity, are less liable to break than those of iron.

Wheels are to a carriage what legs are to a human being—the instruments of locomotion. A man who loses an elastic leg, of bone, muscle, and ligaments, may have a wooden one to replace it; but he will find that the act of walking with the wooden one is a much ruder and less perfect process than with the one of bone and muscle; concussion, and the labor of surmounting or avoiding obstacles, will render the man's progress much slower. And it seems clear, that the property of elasticity in a wheel gives it a similar advantage over a rigid one that the natural leg does over the artificial one, though to a less extent; inasmuch as the mechanical contrivance of art must be inferior to the more perfect processes of nature. Ships, which are of rigid construction, are found to make a slower progress through the water than such as are slightly flexible; and in row-boats, the quality of flexibility is indispensable to swiftness: the reason is, that the flexible boat, as it advances, adapts itself, by its sinuosity, to the slight movements and currents of the water, which it eludes instead of resisting. The movement of a fish through the water is an illustration of the same principle; and, by a parity of reasoning, a carriage with elastic wheels avoids, by its yielding properties, many obstacles over which rigid wheels would require to be impelled by a greater exertion of power.

The general conviction of the advantages to be obtained by using elastic wheels has led to many attempts at their construction, but hitherto without any efficient result. One mode which was attempted was by arranging a number of pointed double elliptic steel springs in radiating lines from a nave to a periphery. To guard against the lateral action or leverage, these springs were doubled in

number, and arranged at a lateral angle with the length of the nave each way. Even supposing such a wheel to be efficient, the expense of its manufacture would have precluded any extensive use of it; but the action was too imperfect, to allow much use without destruction of its parts. The elasticity of the springs could only be brought into action in the direction of the length of the ellipses, either by extension or compression; consequently the action could only be in a line diametrically across the wheel in one direction at a time: thus but few of the springs would be in action at one time, and that in a most imperfect mode, viz., in the length of a very long and narrow ellipse. The principle of an efficient spring wheel should be, that the elasticity should be alike at all parts of the circumference, and that no one part should act without the whole—that every spring should sympathise equally with the rest, from whatever direction a concussion might come. A wheel like that just described could not comply with this condition, and therefore such a wheel could not be durable. Another mode of forming a spring wheel was by making steel blades or ribbands in a sinuous or undulating curve, and forming them in radiating lines from a nave to a periphery, doubling them in the same manner as described in the elliptic spring wheel, to resist the lateral action or leverage. Supposing this wheel to be true and well made, the action would be more perfect than the former one; but the making of such springs all to stand their work equally well, and the needful accuracy of fixing them, would involve an expense too great for any extensive use; and after all, the action would be of that kind very likely to break the springs with a violent concussion. A third plan which has been proposed, but, we believe, never put in practice, is a small wheel placed within the circumference of a solid rigid ring of much larger diameter, the space between being supplied with several small hoops of ribband steel with open ends, put in with compression, so as to leave them free to enlarge or diminish their diameter when in action. These hoops were to be kept in their places by flanged segmental cavities adapted to their size in both wheel and ring, being otherwise unconfined by any fastening. The disadvantages of this form of wheel are many. First, its extreme want of elastic firmness; next, its want of universal action, being calculated only to act by compression on the springs below, and not by extension of the springs above. A great defect would be, that while the weight were pressing on the lower springs, the elastic action of the upper springs would be directed, not to alleviate, but to increase the weight. In action, this wheel would be impracticable; for stones and dirt would lodge in the centres with the springs, clog their action, and break them. But one useful thing they contain, viz., the germ of the only sort of spring which can be effectively applied to spring-wheels—the circle. The wheel itself is a circle continually revolving, and springs intended to have an equal action in that wheel, whatever side be uppermost, must be circles likewise. No other form can be of universal action, in the place of the wheel; no other form will yield extensibility and compressibility in every direction in rapid succession, each tending alike to restore the nave to the exact centre of the periphery, as the momentary action of concussion passes away.

Mr. William Adams, a partner in the firm of Hobson and Co., of Long-acre, has marked this essential principle, and has had the perseverance to work it out in detail, so as to lay it before the public in a practicable form. The leading features of his invention are four hoops of broad steel plate, properly tempered, the ends of the hoops being overlapped and rivetted together, so that each hoop may be solid, by which means it will resist and yield equally, both by extension and compression. These hoops are affixed firmly at equal distances in the interior of a rigid circular rim, which forms the periphery of the wheel. This circular rim is made rigid by its peculiar mode of construction. An inner iron, or steel tire, of less substance than the outer one, is surrounded by a circle of wooden felloes, accurately fitted to the inner tire, and also with their ends accurately fitted to each other like a barrel arch, the lines of the joints meeting in the centre of the circle. Around this circle of felloes, so fitted, the outer tire is shrunk on hot, as usual, and all three thicknesses are rivetted together. In calling this a rigid rim, we do not mean that it is rigid like an iron casting, (for if it were so, it would not stand its work, but be liable to break, as cast iron wheels do;) but that, while it possesses a slight portion of elasticity sufficient to prevent breakage, it is also sufficiently strong to prevent any permanent alteration of its form by any ordinary concussion to which it may be subjected. To this rim the four hoop springs are firmly bolted, but do not in any material manner contribute to strengthen it. The springs serve as elastic legs; the rim serves as a foot to guide the steps they make in revolving. Wheelwrights call the act of putting a tire on a wheel, "shoeing it."

The nave of this wheel is made of iron flange plates, fitted to the axis-box, and reinforced by wood blockings. The flange plates are made in the form of a Maltese cross, and to the arms of this cross the hoop springs are firmly fixed, each with four clip bolts and nuts, without making holes in the spring; and this mode is found to ensure sufficient lateral strength to resist the central leverage of the wheel. The springs are tapered in width towards the circumference, in order to give the greatest elasticity towards the point of concussion. The axis-box is so contrived that it will carry a very large magazine of oil in actual contact with the axis, and the wheel is therefore likely to travel considerably farther without requiring fresh oil than any other kind, more especially as the elastic action removes the extra friction arising from concussion. Most oil axes are fed with oil by a capillary or pumping action. This action is liable to be disturbed from many causes, and if disturbed, the wheel will become fast on the axis by heating. But an axis in actual contact with the oil cannot be liable to these accidents.

One of the first considerations which struck us was, that a wheel with so much metal in it must necessarily be very heavy; but this proves not to be the fact. The peculiar action and combination of the springs being such that all mutually assist and are dependent on each other, the thickness of the plates is necessarily so much reduced below the ordinary standard of spring plates, that great lightness is combined with great strength. Thus a pair of these spring wheels are found to be just so much heavier than ordinary wooden ones as the weight of the inner tire amounts to. But as the axes used in ordinary rigid wheels are made much heavier than is needful for the weight they carry, in order to resist extraordinary concussion, so the axis of the spring wheels, not being subject to the same amount of concussion, may be reduced in weight, in order partly to compensate for the tire; and the surplus weight being thus placed at the circumference of the wheel, instead of on the axis-bearing, the friction will be reduced: and, in addition to this, the freedom from concussion, consequent on the use of the elastic wheel, will enable a saving to be made in the weight and number of the carriage-body springs; and thus a farther amount of weight, and consequently of friction, will be removed from the axis-bearing. In the construction of a wheel-carriage, the weight, as well as the strength of the wheels, should always bear a certain proportion to the superincumbent weight, or the centre of gravity may be too high, a disadvantage nearly as great in a carriage as in a ship. A wheel may be too light as well as too heavy, and the former defect is the greatest. The former is a defect of principle, and is dangerous: the latter can only make a slight difference in the draught by additional weight, and not by additional friction on the axis-bearing; and, at a considerable speed, the weight of the heavy wheel acts with momentum like a fly-wheel.

Mr. Adams' elastic wheel is light and elegant in its appearance, and apparently well adapted for pleasure carriages on common roads; but there is a still more extensive purpose for it to serve—we allude to the railroads, whose increasing number and probable universality render economy in the mode of transport a most important object. It appears, from Mr. Wood's statements, that the difference of wear and tear between carriages with springs and carriages without, on railroads, is as one-quarter to one-half. The springs used in railroad carriages are very short, and have little play, and that only in a vertical line, which is not the line of concussion. At rapid speed, the necessity for elasticity increases in con-

pound progression. The speed used on railroads would tear a carriage to pieces on a common road. A small pebble, or a trifling inequality in the joint of a rail, at a high speed, gives a violent shock, and the momentum of each succeeding wheel, in a long train of carriages, like repeated rapid blows of a hammer, at each action increases the weakness of a loose rail, and ultimately breaks it, or renders it useless. As the elasticity of the spring-wheel acts in a direct line of concussion, both rails and carriages would be saved from it, and the total amount of friction considerably diminished. In the ordinary rigid wheels used on railroads there is occasionally a tendency, when not running in an exactly straight line, for the side of the flange which guides them to mount the rail, and thus overturn the carriage. It seems to us that the lateral elasticity of Mr. Adams' wheel would have a tendency to prevent this kind of accident; for the flange not revolving in a rigid plane, would slip downwards from the rail, as fast as a grinding contact might give it a tendency to mount, and the lateral elastic action would then tend to restore the track of the wheels to the proper position.

An elastic wheel possesses another advantage over a rigid one, in case of the defective construction incident to all wheels, viz., the absence of roundness, i. e. eccentricity of orbit. A rigid wheel of this form must necessarily move with much friction; but the elasticity of a spring-wheel would tend to correct this defect, by yielding where there was the necessity during its revolution.

For ordinary weights, the springs are made in single plates, by which means they may be effectually preserved from rust; but for heavy carriages and engines, the inventor proposes to multiply the number of plates in the same mode as other carriage springs.

Fig. 1 is a side elevation of the wheel. Fig. 2 is the cross section. A is the outer tire; B, the felloes; C, the inner tire; D, blocks to bend the springs on the rim; *e*, the clips to fix the blocks down the springs on the rim; F, the central Maltese cross and axis-box; *g*, the circular springs.

By the simplicity of construction, if a spring should break, it may be removed and re-placed, without taking a carriage off the road, in a few minutes. The railroad central nave is of still simpler construction than that for the common road.

[For the American Railroad Journal.]

Auburn—its present growth; its future prospects; its railroad; its manufacturing power, &c.

Public attention is awakened to the advantages and value of property at Auburn. Real estate is cheaper there than it is in any other growing village in our State. There has not been a period from its foundation in 1805 to the present time, when it has a population of 6 or 7000 inhabitants, that it has not been in a healthy progressive state from its own inherent energy; and whoever looks upon it now will discover no appearance of decay, but in its beautiful dwellings, scattered in every direction, and in its long ranges of three and four story stores of hewn stone, its magnificent hotels, its numerous and splendid churches, and other public edifices, completed and in the progress of erection, will see much to gratify his taste and assure him that he is in a thriving village. When he reflects that this place was once upon the great turnpike thoroughfare, but by the construction of the canal, which passes it at a distance of 8 miles, it was thrown in the back ground, he will naturally look around him for the causes of its constant growth and present apparent prosperity. A little observation and familiarity with the surrounding country will satisfy him. He will discover that it is a central point in one of the most fertile regions of the globe, and that it must always command the trade of the country lying between the Cayuga and Skaneateles lakes; that it is in the neighborhood of the quarries of plaister, (or gypsum,) which supply the farmers with that article in Pennsylvania and New-York, and near to the supplies and manufactories of salt at Montezuma and Salina; and that it has within a few miles of it navigation by the canal, by the Cayuga and Seneca lakes, by the Seneca river and the great lakes, Ontario, &c., to all parts of our continent. This country, abounding in wealth, from its agricultural productions and its mines, and the means of transportation, must have a vast amount of internal commerce. Its only disadvantage, which is its want of means of transportation to the great channels of internal commerce, is soon to be removed by the construction of the *Auburn and Syracuse Railroad.*

A railroad company is formed under an act of the Legislatvre with power to transport persons and merchandize from Auburn to Syracuse. The stock has been wholly taken by the citizens of the two villages and the intermediate and surrounding country. The surveys are now completed, except that a part of the line is to be re-examined. The company intend to complete the work in the course of the next season. The engineers estimate the whole cost of the road, which is to be made in the most substantial manner, at $300,000. The capital of the company is $400,000. The distance is about 26 miles.

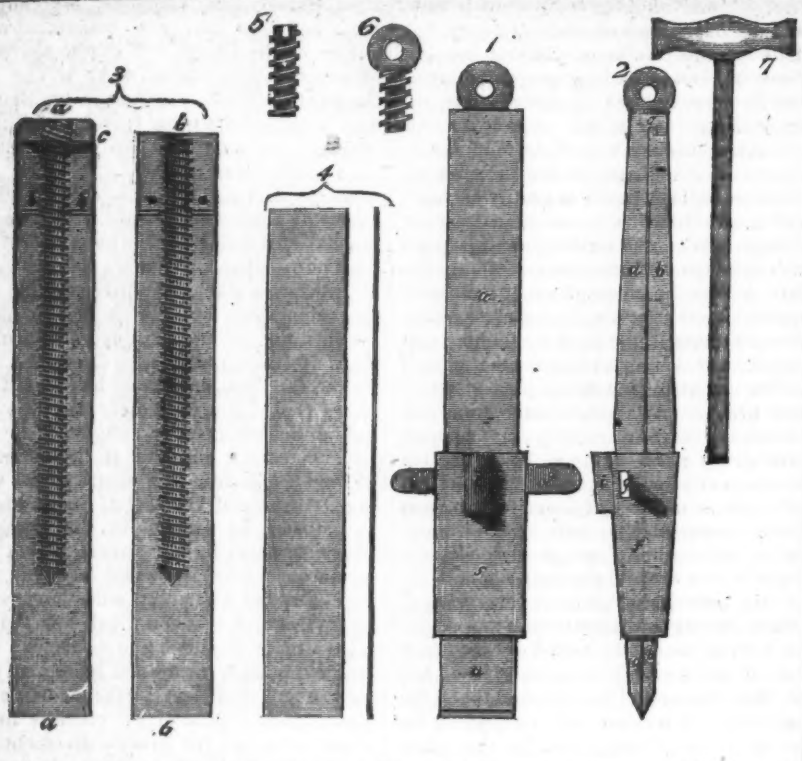
This road, in addition to being a part of the line of the great thoroughfare, will have the advantage, not only of carrying goods and produce, as part of the great western trade, but also, of the local transportation from Auburn and its vicinity, and intermediate country, to the canal at Syracuse. The amount of this business is almost incalculable. It embraces the merchandize and country produce which is bought and sold at Auburn; the produce of the inexhaustible stone quarries and lime at Auburn; the raw materials and manufactures at the State Prison, which employ constantly 700 hands; the trade through Owasco lake from Homer and its surrounding country; the trade from Skaneateles, Camillus, Marcellus, &c., and also the great manufacturing power of the village. To these sources of revenue, which must make it one of the most profitable railroads in the State, may be added the great travel which the business between the two places must necessarily create.

Manufacturing Power.—The water power at Auburn is immense. The small amount of it which has yet been improved does not, perhaps, so much exhibit a want of enterprise among its citizens as it does the remarkable fact, that it has so long escaped the prying scrutiny of speculation. It may, perhaps, be accounted for by the fact, that enterprise has, for a few years past, followed closely the line of public improvement, and neglected many advantages not directly in its course. Within a mile from the centre of the village, upwards of 130 feet of perpendicular fall can be created in the Owasco creek: a never failing stream, which issues from a lake, two miles from the village, forming a basin 12 miles long, with an average of one and a half mile wide. The stream is subject to no floods: the water gradually rising and falling in the lake about five feet in the course of a year. The bottom of the creek is limestone rock, and the banks convenient for damming and erecting works. An incorporated company is about constructing a canal for navigation, as well as hydraulic purposes, from the lake to the village, which will afford them a head of forty feet water, and enable them to discharge the water from their works into the pond of another owner in the centre of the village. The amount of flouring mills, manufactories, machinery and mechanics, which the water power at this village may put in operation, is incalculable. There can be no doubt, that from its position in the centre of a fertile and populous country, where provisions are abundant, the excellence of building materials, the perennial supply of water, its equable discharge, its great reservoir, its immense fall, its access to market, that Auburn is one of the best, if not the very best, manufacturing stations in our State. It is destined, beyond all question, to become within a very few years, from the number and magnificence of its public and private structures, and the beauty of the surrounding country, one of the largest and most desirable and popular of our interior cities.

[From the Repertory of Patent Inventions, &c.]

Specification of the Patent granted to JOHN SMITH, *for a certain Improvement on Chisels or Instruments for cutting or dressing Stone, and certain other Substances.* Sealed December 23, 1834.

In ordinary millstone chisels, and also in chisels for cutting, dressing, or working other stone, and also for dressing cast iron, it is well known that the cutting edges quickly become worn, and consequently constantly require sharpening, which operation is performed by heating the same and forging such cut-



ting edges to the degree of sharpness required; the operation of tempering is then to be performed; all which requires much time and judgment, and in places distant from a forge becomes a matter of considerable consequence. Now, the object of my invention is to use a thin plate of steel, properly tempered, which being supported on either side by cheeks, such steel plate, (as it becomes worn,) being capable of movement in order that a sufficient quantity for the cutting edge shall project beyond the ends of the cheeks, yet such thin steel plate, when in use, is rigidly held between the two cheeks, and prevented receding from its work by a screw, whereby the whole, when combined, will produce a strong and highly useful chisel, as will be hereafter more clearly described.

Fig. 1 represents the side view of a chisel constructed according to my invention.

Fig. 2 an edge view thereof.

Fig. 3 represents the two cheeks, which I usually construct of iron and case-harden them.

Fig. 4 is a flat view, and also an edge view of the thin steel plate which constantly supplies a cutting edge to the chisel.

Fig. 5 is a short male screw which fits the female screw formed in the cheeks of the chisel.

Fig. 6 is a small screw, with a ball or knob at the top, which screws into the upper part of the chisel when the same is intended to be used with a mallet. And it may be desirable here to remark, that when the chisel is used for dressing millstones it is affixed in a wooden handle similar to those used for ordinary chisels.

Fig. 7 is a hammer for driving the socket and also the wedge or cotter hereafter mentioned; and on the end of the handle is formed a key for screwing up the internal screw, fig. 5, in order to press forward and support the steel blade as it becomes worn.

Having thus generally referred to the figures in the drawing, the construction of the parts there shown will be evident to any competent workmen, I will enter shortly into the manner of putting the same together, first observing that in each of the figures shown in the drawing the same letters of reference indicate similar parts. *a* and *b* are the two cheeks which constitute the main frame of the chisel; these cheeks go together by means of the mortice, *c*, and the studs, *e*, *e*, which latter into recesses formed in the cheek, *b*, as will be evident on inspecting the various figures. The thin steel plate is next inserted between the two cheeks, *a*, and *b*, the socket, *f*, is then to be placed on the end of the cheeks of the chisel, which being wedge form, the driving up of the socket will cause the same to bind more closely on the steel plate between them, and hold the same rigidly, and thus prevent lateral spring. It should be remarked, that on the cheek, *a*, is formed a groove, and in the socket, *f*, are two openings through which the wedge or cotter, *g*, is inserted and driven, by which the whole of the parts are securely held together. The screw, fig. 5, is to be screwed up within the female screw, in order to press against the other end of the steel plate, to assist in preventing its receding from its work. In using a chisel so constructed, the steel plate which constitutes the cutting edge will only require occasionally to be rubbed or ground on a stone in order to improve the sharpness, and as the same becomes worn away, in order to project a further quantity beyond the end of the cheeks, *a*, *b*, it will only be necessary to remove the wedge or cotter, *g*, and slide down the socket by giving it a few blows on the knob, *i*, the screw, fig. 5, may then be screwed up by the key on the handle of the hammer (fig. 7), which will project a further quantity of the steel plate below the ends of the cheeks, and such will be the case till the screw, fig. 5, arrives at the end of the female screw, when there will require a fresh steel plate to be inserted. At each time of projecting the steel plate the socket is again to be driven up, and the cotter or wedge inserted as before described.

Having thus described the nature of my invention, and the manner of carrying the same into effect, I would have it understood that I do not claim any of the parts separately of which the same is composed, but I do hereby declare that I confine my claim of invention to the combining of the various parts as above described into a chisel for cutting or dressing stone, and certain other substances, whereby I am enabled to use a thin plate of steel as the cutting edge, which may from time to time, as it becomes worn, be projected forward and offer fresh quantities for use, and yet, when in use, be rigidly held between the two cheeks, and prevented receding by the male screw, as above described.

Enrolled Feb. 23, 1835.

[From the London Mechanics' Magazine.]

HUNTER'S STONE-PLANING MACHINE.

In March last, a patent was granted to Mr. James Hunter, of Leys Mill, Arrobath, "for certain improvements in the art of cutting, or what is commonly called facing and dressing certain kinds of stone." The specification of Mr. Hunter's method has not yet been enrolled; but from a Report, with a copy of which we have been favored, made to the proprietor of the Leys Mill Quarries, (W. F. L. Carnegie, Esq.,) by Messrs. Carmichael and Kerr, engineers, of Dundee, who were invited to see the method in actual operation at these quarries, and to verify the results, it appears to be immensely superior to any other hitherto devised. Mr. Hunter has seemingly realized that great desideratum, a power-machine for the cutting and dressing of stone, capable of withstanding the extraordinary friction to which it must necessarily be subjected. The despatch with which immense blocks of stone are cut up and dressed, by Mr. Hunter's apparatus, is prodigious; yet the cost of tools is next to nothing—"only a half-pennyworth of steel for every hundred feet of planed surface!"

Report of Mr. Charles Carmichael and Mr. John Kerr, Engineers, Dundee, on the power of Mr. James Hunter's Stone-planing Machine.

Sir,—Agreeably to your desire, we have visited Leys Mill Quarries, and attended minutely to the performance of the stone-planing machines. These machines do their work most effectually, as the following experiments, which we witnessed, will testify.

Experiment First.

We went to one of the machines that had six stones laid on the bench, one of which was planed, and the second begun to be operated upon; while this was doing, we took the dimensions of the other four stones, viz.:

Number of Stones.	Length of Stones.	Breadth of Stones.	Thickness.	Finished Thickness.	Quantity taken off.
	ft. in.	*ft. in.*	*inches.*	*inches.*	*inches.*
1	5 3	2 6	3½	2½	1
2	5 0	2 8	3	2⅜	⅝
3	5 6	2 6	6	4½	1½
4	4 0	2 3	4	2½	1½

The average thicknesses of the above stones are given, but many parts of them were much more than the thickness stated. One of the broad finishing tools was blunted ere the experiment began, and was changed when No. 2 was in the operation of being planed. No. 3 was a very hard stone, and was what is technically called yolk, in planing which one of the roughing tools broke at the point; still it wrought out the stone, and was then replaced. A splinter came off the face of the last stone, when about half finished, which was another cause of delay, as they had to go over it again; but, notwithstanding the delay occasioned by the breaking of one tool, by another being changed, and by having to go over the one half of the last stone twice, yet the time altogether was forty-five minutes, being at the rate of sixty-five superficial feet per hour.

Experiment Second (same machine.)

Five stones were now put on the planing machine, of the following dimensions, viz.:

Number of Stones.	Length of Stones.	Breadth of Stones.	Thickness.	Finished Thickness.	Quantity taken off.
	ft. in.	*ft. in.*	*inches.*	*inches.*	*inches.*
1	4 3	2 2	4¼	2¼	2
2	3 9	1 10	4¾	3½	1½
3	3 4	2 8	6	4	2
4	3 6	2 0	6¼	4¾	1¾
5	3 8	3 6	5½	4½	1

These stones were planed in forty-two minutes.

The above stones were taken from the quarries without selection, and the men that were working the machine were not informed of the object of our visit. Experiment first began at half-past twelve o'clock, noon, and experiment second was concluded at nine minutes past two; thus leaving twelve minutes for cleaning and reloading the bench of the machine. Had all the stones been 5½ feet long, they would have been planed in exactly the same time, for the machine travels the distance for that length; so that nearly sixty-seven feet of surface would have been planed in forty-two minutes.

The stones, as they come from the machine, are remarkably smooth and straight on the face; and were it not for the shade left by the tools, we would be apt to think them polished, as they feel as smooth as a polished stone.

We were told by the foreman, that during the last week there was planed 4,400 superficial feet, more than half of which was planed on both sides, (indeed more than half of all the stone that leave the quarry are planed on both sides,) by four machines. We saw the pay-list for the week: the amount was £6 1 6

Add blacksmith for dressing and grinding tools, 12 0

£6 13 6

We were further informed by the manager, that during the last summer there were upwards of 100,000 feet of pavement planed by four machines; and there was one thing that struck us most forcibly, which is the small degree of wear on the tools. Three shillings a week, or sixpence per day, is the cost of the labor for dressing and grinding the tools of one machine; and the whole consumption of steel during the last year was under a hundred weight, so that, if we measure both sides of those stones that were actually planed on the two sides, it will be seen a pound of steel will plane 1,500 feet, or about a half-pennyworth of steel for every 100 feet of planed surfaces.

There are now five machines working in the quarry, wrought by a steam engine of six-horse power, the steam cylinder of which is sixteen inches diameter, stroke two feet. Besides the machines, the engine has to work two inclined planes, one of which is for dragging up the pavement from the quarry to the machines; the distance on the incline 48 feet, ascent 1 foot in 5; average quantity about thirty tons per day of ten hours.

The second incline is for dragging up the rubbish from the quarry to the place where it is deposited; distance 87 feet, ascent 1 foot in 4; quantity from 50 to 60 tons per day of ten hours.

The above shows what the engine is actually doing; and we have no hesitation in saying that the engine would work eight machines besides the inclines without being overloaded; and our opinion is that a machine, on the average, is not much more than one-half-horse power.

We are, Sir, your most ob't serv'ts,

C. CARMICHAEL,
JOHN KERR.

To W. F. L. Carnegie, Esq., Kimblethmont, Arbroath.

Note by Mr. Carnegie.

To explain the difference which is apparent between the quantities of planed stone, which, according to the statement of the engineers, *might* be produced in a given time by the machines, and the quantity stated to them as in one week actually sent to market, it is necessary to remark,—1st, That it is found in practice to be cheaper to dress the stones by the machine in the rough state and shapeless form in which they are taken from the quarry, and to square them by hand afterwards, than to follow the opposite course, as is done where the whole work has to be performed by hand; thus a great quantity of work measured by the engineers, but not available in the market, is nearly lost. 2d, A considerable quantity is required to be dressed over twice on one side, or on both sides, according to circumstances; thus the stones, No. 3, in Exp. 1, and Nos. 2, 3, 4, 5, in Exp. 2, being too thick, were redressed on the under side to suit the market. 3d, The quarry does not always afford stones of a size to fill the benches, when much power is lost, as the machine has to traverse the whole width. 4th, Other circumstances, (such as bad weather, &c. &c.,) which will readily present themselves to the minds of those conversant in these matters, always occur to prevent general results from attaining the extreme limit, which may be calculated as possible from the data of a short experiment. Mr. L. C. having been present, can confidently testify as to the correctness and impartiality with which these experiments were conducted, and to the truth of the information furnished to the engineers, by those in his employment.

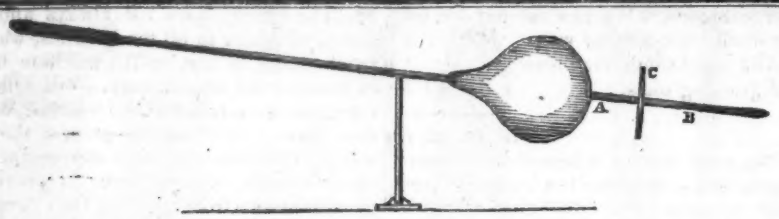
[*From the Boston Atlas.*]

PUBLIC LANDS IN MAINE, No. 1.—As the Timber Land mania is raging with such violence at this time, we have been induced to look a little into the subject, with the view of furnishing such information as might be interesting or important to our readers. We have been indebted for the following facts, to a series of articles, written by a gentleman thoroughly acquainted with the subject, and originally published in the Portland Advertiser.

About forty years ago, that tract of country now comprising the counties of York, Cumberland, Lincoln, Kennebec, and a little of the south part of Oxford, constituted the great Lumber Region of Maine. The whole country east of Lincoln and north of Kennebec, and the southern towns of Oxford, contained probably less than two thousand families. Machias was then an old establishment, and its lumber men had penetrated to some distance up the West and East rivers; but more than nine-tenths of their timber was still standing.—Quoddy contained about one hundred fishermen, but was to all intents an unknown land. "The rivers from there to St. George had hardly begun to strew sawdust in the way of the salmon." Logs had been brought down the Sago from the Fryeburg and the Ossipee, but no visible impression had been made on their immense forests. The Presumpscot at that time had hardly floated a pine above Sebago lake. The more enterprising of the lumberers were beginning to bring logs down the Little Androscoggin, the then remote wilderness of Hebron. On the Great Androscoggin, the pine forests at any distance from the river were hardly touched higher than Lewiston. The Kennebec and its tributaries, as high up as Sandy river, had yielded a portion of their timber to the market.—But one hundred and thirty townships, of six miles square, would comprise all the territory on which any considerable quantity of pine timber had been cut in Maine. A very large portion of these were covered with dense forests of the best of pine, nine-tenths of which was still standing. In general this territory was even then as well timbered as any other part of the District.

The population of this tract was then about equal to that which is now in the counties of Penobscot and Somerset alone. To the men of that day, the timber within its limits seemed inexhaustible.—But where is it now? There is not a pine in the region large enough to tempt the axe of a Penobscot lumberman.

Since that day, and in some cases before, the lumberers have either been the pioneers of the agricultural settlers, or have followed immediately on their footsteps. No township has been long settled before destruction has overtaken its pine timber.—This destruction has been, and is still proceeding, in advance of the settlement, to an extent, and with a rapidity, that can hardly be credited. Since the period of which we have been speaking, about one hundred and fifty towns have been begun and settled, and the timber, in those of them that contained any, is now wholly cut off. Besides these, there are one hundred additional townships; some of which are partly settled, and in all of which, containing any timber of consequence, the best and largest part of it is gone.



[From the Repertory of Patent Inventions, &c.]

Specification of the Patent granted to JAS. *and* JOHN HARTLEY, *for a certain Improvement or certain Improvements in the Manufacture of Glass.* Sealed October 22, 1834.

Our invention relates to part of the process employed in the manufacture of that description of glass called crown glass, used for the purpose of glazing windows and other purposes. It is well known that this description of glass is produced from the metal by blowing the same into the form of globes, and afterwards, by means of the operation called "*flashing*," such globes are thrown open into flat circular plates called tables. Now, our invention relates to that part of the process of manufacture which consists in blowing the metal into globes. According to the ordinary process, the metal when taken from the pot by the pipe is rolled on a smooth iron surface, in order to bring the outer end of the metal to a conical form, the extreme end of which becomes the outer axis of the globe during the operation of blowing and working the glass into the required form. This outer axis is called the bullion. During the expanding of the metal into the globular form, the workman rolls the bullion along a straight edge, or bar, called the bullion bar, as is well understood. In doing this, the outer end of the glass globe, whilst expanding, and continually revolving, rubs against the bullion bar, by which action parts of the surface of glass is disturbed or made irregular, and as the globe extends in dimensions this rubbed surface enlarges: the consequence is that when the table of glass is complete, there are at all times more or less waved lines for some inches around the bullion or the centre of the table of glass, which lessens the value of so much of the table. This prejudicial appearance is produced to the glass as before stated by that part of the surface coming in contact with, and rubbing against, the bullion bar, when the metal is in a soft and pliant state. Now, the object of our invention is to dispense with the bullion bar, and to supply its place by the application of a tube or hollow bearing for the bullion or outer axis of the globe of glass during the expansion of the same: by this means that part of the surface which was heretofore rubbed against the bullion bar, is, when worked according to our invention, in no way prejudicially acted on, and the waved appearance before consequent on the manner of operating is avoided.

The drawing represents an ordinary pipe with a globe of glass, the bullion, *a*, being supported by the tube, *b*, in which it is caused to revolve by the workmen when working the metal into the globular form desired during its expansion. On the tube *b* is placed a shield, *c*, which is intended to prevent the heat coming from the heated glass, injuring the hands of the boy who holds the tube. The workman, in performing this part of the process of manufacturing glass, takes a proper quantity of metal on the end of the pipe, and proceeds to form the outer end of such metal into a cone; he proceeds with the process in like manner to that heretofore pursued till the globe of glass requires support at the outer end by its axis or bullion, *a*, that is to say, he proceeds in the ordinary manner up to the period at which (according to the old means of operating) the bullion would have been rested on, and revolved, and run along the bullion bar, but in place of so running it along the bullion bar, a boy holds the tube or hollow bearing, *b*, in such manner as to receive the bullion, *a*, and the workman causes the globe to revolve till the globe is sufficiently expanded. The same is then to undergo the operation of flashing as heretofore.

Having thus described the nature of our invention, and the manner of carrying the same into effect, we would have it understood that our invention consists in the application of the tube or hollow axis, *b*, in place of running the bullion along the straight edge, called the bullion bar, as above described.

Enrolled April 22, 1835.

[From the London Mechanics' Magazine.]

EVIL EFFECTS OF THE DIVISION OF LABOR.—In attempting to prove that the minute subdivision of labor has an evil tendency, I am aware that I shall meet with few who will admit the evil to be so extensive as I shall endeavor to point out; and it is very probable I shall be written down by some of the many able correspondents of the Mechanics' Magazine. But as the following facts are the results of long observation and experience among the working classes, I have resolved to publish them anonymously, in the hope that they will meet the eye of some who may be benefitted by them; and should they be the means of convincing even one, I shall consider myself happy in having brought the subject into notice. I have myself served an apprenticeship to a mechanical profession, and had then ample opportunities of observing the causes that tend to bring about the moral degradation of some of the working classes.

That the division of labor produces a cheaper article, and is a great source of national wealth, I readily admit. I believe were it not for this very cause, Britain would ere this have lost her political status among the nations. Groaning under a load of taxation, which no other nation on earth could have borne, we have been driven into an artificial state of society, and the division of labor with all its attendant evils is one of the results. This is illustrated by the fact that we export machinery to countries where workers are obtained at half the price: and yet these countries are unsuccessful competitors in the same market with the poor tax-eaten British. Our national vanity whispers that this is owing to our superior genius; but I contend that it is our artificial mind-degrading system of dividing labor, which by making individuals do only *one part of a thing*, with mechanical, or rather slight-of-hand, rapidity, enables us to produce a whole as cheap as our foreign brethren.

But the effects of this system upon society is truly deplorable. A poor boy, with very little education, is bound an apprentice for five or seven years, to do one particular act; he commences cheerfully, and in a few weeks can manage it completely; the only difference between him and a journeyman being that he takes twice the time. He is now doomed through life to be a *mere machine*; all the delight he felt in learning his trade is over; he has no more mental work to perform, and he goes on from day to day with his monotonous task without excitement of any kind, save the temporary one of the gin-shop: there, amongst the rudest ribaldry and mirth, he is exhilarated and *comparatively* happy. Next day he returns to his labor in the most melancholy and discontented mood, and hastens on with his work to procure the means for "a hair of the dog that bit him." In short, as his profession does not exercise his intellect at all, he cannot fail to indulge in what *he* thinks his only pleasure. Let us suppose this to be continued until he reaches man's years, when the effect will be seen in an intellect, blunted, and quite useless from inaction. For we know well, that the thinking, like the physical, part of the man, is either perfectly or imperfectly developed—by proper or improper exercise. This man's brain is unexercised, nay, it is diseased; he has acquired a sensual and ungovernable appetite for the drug that enfeebled, and still continues to enfeeble, both his mind and body, and he is in such a morbid state, that all his efforts to reform or improve his mind are ineffectual. He tries Mechanics' Institutions, and all the other schemes for improving the working classes, but to no purpose; his mind, from want of habit, cannot follow the lecturer; he gets inattentive—sleeps—and loses the thread of the subject; repeats his visits for a night or two, perhaps, and the lectures get to him "the longer the drier," until he quits in disgust, what might, under other circumstances, have been a source of enjoyment to him. When such a character enters into the solemn engagements of matrimony, his previous habits and badly regulated mind ill qualify him for the various duties of husband or father; he brings into the world a few squalid, degenerated wretches, and by his brutal conduct, drives his well-disposed partner to that temple of infamy the gin-shop, for the melancholy purpose of "drowning her cares." I will not disgust the reader by dwelling upon the united effects of their example on their thus hereditarily vicious offspring. The wretched man continues to work and drink alternately, until he reaches the workhouse if in England, and beggary and crime if in Scotland: a poor grumbling, discontented, shameless pauper, both unable and unwilling to work; for the man who has spent twenty years of his life sharpening pin-points, or guiding a self-acting turning machine, has not physical strength to handle a spade or road hammer, even if he had not been previously wasted by dissipation. This is not an exaggerated picture; the melancholy details of evidence brought

before the Factory Commission furnish multitudes of such instances. It is not the long hours, however, that is the sole cause of this evil I maintain: it is the division of labor that is the root of the evil, which I shall endeavor to illustrate by another example, *not ideal*, but like the former, *real*: and the writer has many characters under his own eye, of both kinds, to choose from.

In Scotland, some ten or twelve years ago, the division of labor was not (and is not even now) carried to the extent that it is in England, and consequently the working classes have a higher moral character, which is commonly ascribed to education, and a modern training. This is the case in a very few instances; by far the greater number of the Scotch mechanics and operatives receive a very limited education. When they are sent off to a trade, they can half read, and perhaps make shift to write the letters of their own name—but the difference rests here; the Scotch mechanic has to do a great variety of jobs, not one of which he can do so quickly as the expert Englishman.

As an instance: About twelve or fourteen years ago, an engine-maker had to learn to make a tolerable good pattern; he had to turn both iron and wood, to fit up, put together, and attach the engine to the factory; he had thoroughly to understand drawings, and in many cases had to draw himself. The reader will readily imagine, that this must be a clumsy "Jack of all trades:" this is not the case however,—he is a slow, but a good workman. Suppose exactly such a boy as we took in the former case, bound apprentice to this trade for seven years: for one year he is allowed to run loose about the work, he is every "body's body," runs messages, creeps into holes to do jobs which men cannot reach. By the end of the year, he has acquired a very rude general notion of the whole work, but can do little or nothing with his hands. He is now stationed at a bench, and from making simple articles, comes on with great satisfaction to himself to make good patterns; he then wearies, because he thinks himself master of the subject; having little mental work to perform, he is now in great danger of going astray, but happily for himself he is shifted to another department, upon which he enters with great spirit, and feels with intense delight, as bit by bit he masters the various tasks put before him. His brain thus stimulated and exercised, a thirst for knowledge is created, and he is driven in search of food for his mind to a Mechanics' Institution, where he hears and sees, for the first time, the astonishing fact, that the water he drinks is composed of two gases that burn. This leads him to endeavor to read, that he may learn more of the matter, but he finds he cannot do it so quickly as he would like; he then sets to work with good will, goes to an evening-school, and his mind being in an excellent state for receiving instruction, he makes most rapid progress. I need not trace him farther—here is a useful and promising member of society, who himself enjoys life and all its blessings. A few such (according to the strength of their intellect) turn out eminent men—the rest are scattered over the earth in the shape of managers, superintendents, and foremen, of flourishing works; and it is worthy of remark, that in all the large manufacturing towns in England you find a large proportion of Scotchmen doing the intellectual work of large mechanical establishments. This does not arise (as Sandy's vanity always suggests) from a "national superiority." John's head is just as good as his, as is seen in every case where there has been the same chance of getting the organs developed. I regret to state that the baneful system of dividing labor is fast spreading in Scotland, and the moral degradation attending it cannot be denied by the most ardent admirers of the religion and morality of that country. It must not be supposed that the character I have last attempted to describe has been exempt from temptation. No, he has kept company with the drunken and the dissolute (of which there must be a large proportion in every society;) but his mind having been properly set to work, he soon calculated the amount of real pleasure or pain to be derived from seeking after knowledge, or from a course of profligacy. Nor must I be understood as assuming that all are depraved who labor at one particular object all their lives, for there are some minds that naturally resist the influence of such causes; but the number of the good bears a small proportion to the bad in countries where this vicious system is carried to great extent. There is another demoralising effect yet to be noticed, which I shall endeavor to do as briefly as possible. An improvement in machinery often turns hundreds adrift upon society, who having spent the best part of their lives in some such trifling work as heading pins, are too old to learn another business, and for reasons already mentioned they cannot do out-door work; their minds being untutored, they do not make a very vigorous effort to do their best at a new job, well knowing that they will not be allowed to starve in England. In many, very many cases, such men direct their blind rage to the breaking of machinery, not only the machine which superseded them, but machinery of all kinds; in short, a large proportion of the seditious, the incendiaries, the swings, machine-breakers, &c. which disturb the peace of society, are division-of-labor people, thrown out of work, and who have neither physical nor mental strength left to turn themselves to another decent employment, seeing that the few that do so are scarcely fit to earn sufficient to support a miserable existence.

It is common enough to hear the *lordly* aristocrat, or wealthy man of business, express their *disgust* in such unmeasured terms, as the "beastly multitude," the "canaille," the "scum of the earth," &c., and grumble loudly at the overwhelming poor-rates. Let them examine themselves carefully, and see that they be not aiders and abettors of such infamy. Let them remember, that the cause of this evil is *overtaxation* (and every one who directly, or indirectly, robs the public purse, is to blame for perpetuating the evil,) and not turn away in disgust from his fellow-being whom he has already injured.

We take some trouble to educate the lower animals, and if some of these our humble servants are not so tractable as could be wished, we do not vent our anger upon them, but upon their trainers. Why, then, should the higher classes *spurn* the poor, misled, untrained mechanic, whose labor has perhaps enriched them? It were a wiser course, and a way to root out the evil, were they to set on foot a proper plan of national education, inquire into, and amend, some of the absurd apprentice-laws, and put the rising generation in the way of acquiring more than one branch of a business, in order that their minds may be so far exercised as to make them good members of society, instead of converting them into *mere machines* for the acquisition of wealth. We see the good effects produced in the middle classes by education. Why, then, should a large proportion of our fellow-creatures be allowed, or rather doomed, to remain in a state of darkness? I trust these remarks will be followed out by some of your abler correspondents at some future period. I am afraid I have already occupied too much of your valuable space. L.

May 4, 1835.

[From the Utica Observer.]

An Appeal to the Citizens of Oneida county, on the Enlargement of the Erie Canal.

The importance of the project which was authorized by the last Legislature, to wit., the enlargement of the Erie Canal, demands the most serious attention of the citizens of Oneida. Their interests it is apparent is common with many other counties of the state, indeed all that have an interest in the navigation of the Canal must be concerned in this measure, which is designed to extend its capacity, the economy of its navigation and its general usefulness. But we appeal especially to the citizens of our own county, with whom we feel a common interest in its character for its intelligence and enterprise, and also for its prosperity. To you, fellow citizens, we look for an attentive examination of a project which deeply affects your interest.

Had any man predicted at the time the Erie Canal had its original dimensions settled, that in less than 10 years after its completion the Legislature would have authorized the doubling of its locks, and the enlargement of its dimensions, and that this would be done because the Canal had already about reached its capacity with single locks, he would no doubt have been considered a visionary, whose opinion was entitled to no more weight than a dream. But, chimerical as it would have appeared, experience has unfolded its reality; yes, in less than 8 years the Canal Commissioners recommend the construction of a second set of locks, and in less than 9 the Governor recommends the enlargement of the Canal, as a necessary measure in connection with the doubling of the locks.

In his last annual message to the Legislature, the Governor, in relation to doubling the locks, says, "I regret that the measure was not accompanied with another almost equally necessary, providing for the enlargement of the capacity of the Canal: for I deem it important that the new locks should be made with reference to this latter improvement." The Canal Commissioners on the subject, (see their report of January 1835, Assembly Documents 143,) remark,—"But on the eastern section of the Erie Canal, the crowd is already considerable and rapidly increasing." * * * * * "It is the common navigable strait between the Atlantic and the great western lakes, and by position designed to accommodate the trade and travel of the enterprising and rapidly increasing population of the territories bordering on those lakes and their tributaries, almost illimitable in extent and inexhaustible in fertility. The necessity, now felt, of affording increased capacity to the Canal east of Syracuse, will in a few years be felt in its whole extent: the precise period may be disputed, but the event is certain." Page 20 of same report, the Commissioners say, "If, in the spirit of an enlightened and liberal policy, adequate capacity shall be afforded to the Canal, our western brethren will be accommodated, and their comforts increased; the resources of the state be augmented; a rich and in-

creasing commerce will excite and reward the industry, enterprise, and skill of our citizens, in agriculture, arts, and commerce; and the state, by affording the utmost facility to that busy intercourse of trade, which improves the moral and social relations of civilized life, will at once confer on its own citizens the most lasting benefits, and on all others, in the only measure in which a bountiful Providence permits states to do them good—the greatest benefits and blessings. "The Commissioners, therefore, respectfully submit to the Legislature that provision be now made by law for all improvements in the Canal which the Legislature shall deem necessary. The extent of these once settled, every step in the progress will be uniform, consistent, and tend to the desired result. The limits of the canal once prescribed beyond the reach of probable change, our own citizens will be the better enabled to make their contiguous and substantial improvements and direct their energies, to the increase of their wealth and happiness. The citizens of other states, in these improvements, once authorised, will find a perfect guarantee, that the products of their industry, through this Canal, will always find a free and easy transit to and from the Atlantic and the Lakes,—and trade and transportation will be invited to it, by the strong inducements of interest."

The Canal Committee of the Assembly, to whom this subject was referred, made a special report, (see Assembly Documents 354,) which, together with the document above quoted from, should be carefully read by every citizen who thinks himself worthy to reflect on the interests of the public. The committee remark—"The history of the past fully confirms the opinion entertained by those who have had the opportunity of observing the progress of our internal trade, that the time is not very far distant when the business on the Erie Canal will require the constant use of double locks, with all the advantages of an enlarged Canal and the consequent increase in the tonnage of boats."

"Within the last eight years the business on the Canal has nearly doubled, although but a small portion of that business has been derived from places beyond our own limits. Still our resources are but partially developed, and without regarding the trade from other quarters, it is not too much to anticipate that the Canal in its present condition will soon be inadequate to the wants of our own citizens. It is estimated that one seventeenth part only of the trade on the Erie Canal, is from parts without the limits of our own state; and yet the business during the last season was nearly or quite equal to the capacity of the Canal for its accommodation. It is already estimated that the detentions of a boat making a trip from Albany to Buffalo and back, during the most active season of navigation, are equal to the loss of two days; and this difficulty must increase with the increase of internal trade."

"Although but a small part of the revenue of the Erie Canal has thus far been derived from abroad; the progress of settlement and cultivation in the great and fertile regions of the west, which must naturally seek a market through the state of New-York, affords the most satisfactory assurance that the tonnage on the Canal will very soon be doubled, without taking into account the increase of our own trade."

In the reports referred to, there is much interesting matter in relation to the importance of securing to the state the trade of the extensive territory beyond its borders, which from its physical geography will most naturally seek New-York as the avenue of communication to the Atlantic. This trade is highly important to the state in general, in regard to the revenue it will produce. The city of New-York has a deep interest in its full developement, and it will greatly augment business in the vicinity of this great thoroughfare. But to us, in Oneida, the great object is to have an easy and cheap communication to the Atlantic market. The influence of the question of enlargement on the economy of transportation, is highly interesting to all concerned in the navigation of the Canal, and particularly to the agricultural interest. It is obvious that our agricultural productions constitute a large item in the tonnage of the Canal, and when taken in connection with the heavy articles of merchandize, salt, lime, and gypsum, consumed by the agricultural portion of our community, the interest of the farmers of our county, in obtaining cheap transportation, will appear far greater than that of other citizens: and demands from them a corresponding attention to the great enterprise under consideration.

In relation to the economy of transportation, the Canal Commissioners in their report before referred to, observe: "The increased width and depth of water would afford a canal of easier traction, and in the navigation of which, boats would be less exposed to injury than they are at present from contact with each other, or the banks. A moderate increase in the length would add much to the tonnage of the boat, and if the cross sections were the same, would require but a small addition to the power of traction. In truth if the Canal and boats were enlarged in this manner, to double the tonnage now usual, the crews to manage and the teams to move the boats would be about the same as now employed on the Canal."

On this point the Canal Committee in their report (before quoted from) says: "By doubling the locks, and increasing the capacity of the Canal, so that it will admit boats of 120 tons burthen, will reduce the charges for transportation more than 50 per cent. exclusive of tolls, which will be a reduction of over 25 per cent in the aggregate expense; and the Canal will be in a condition to accommodate more than four times the present amount of business." A reduction of 25 per cent. on the freight now constituting the regular tonnage, is itself of great importance. Last year it was estimated that more than $3,000,000 was paid for transportation; twenty-five per cent. would be a saving of $750,000—or more than half the tolls—and when the business reaches four times the amount of last year, this item will be three millions per annum. When this period arrives, we could afford to pay half the present tolls and have a navigation cheaper than the present Canal would be free of toll. But there is another, and to our county perhaps more important, advantage in this reduction of expense: in the facility it will afford of sending to market articles that will hardly bear transportation at present rates. The soil and climate of Oneida county in general is better adapted to produce the coarse grains than wheat. At times, the Atlantic market will enable us to pay transportation on these products, but the price is not always sufficient. If the reduction contemplated may be realized, then our corn, oats, and barley would become articles of cash value at fair rates. We could rely upon a fair cash price for our corn, with as much certainty as the farmer in Monroe does for his wheat. The importance of the contemplated reduction is too apparent to need further demonstration, to an intelligent community; and we only call attention to the leading points on this subject, believing our fellow-citizens will not be slow to see their importance, or to pursue such measures as will secure the object.

From the quotations before made, it will have been seen that, whether we regard the capacity that will be required, or the economy of its navigation, the enlargement of the Erie Canal is highly important. The opinions given are not those of men, enamored with a darling project that has little to recommend it but their enthusiasm, but they are the result of indubitable facts; facts that are open to the investigation of all that feel an interest in the subject. The facts have indeed compelled the adoption of opinions more rapidly than most men were willing to yield assent to the evidence of their senses, the mind being reluctant to keep pace with the rapidly accumulating demands of business. The subject has not received the attention its great importance demands from an intelligent community. This is obvious from the fact that, in all the recommendations, no definite dimensions are proposed, and it is known that the Legislature authorised nothing specific, but gave the Canal Board authority to settle such dimensions as they should deem proper. The Canal Committee proposed that the enlargement should be sufficient for boats of 120 tons, but the dimensions most suitable for this they left to be decided by the Canal Board.

The Canal Board have had a meeting and decided to enlarge the Canal to 6 feet deep and 60 feet wide: but have also authorised an estimate of the cost of 6 feet deep and 60 feet wide, and of 7 feet deep and 70 feet wide, to be submitted to them at a meeting to be held the 20th of October next. The authority for the estimate may be considered a tacit expression of the Board, that they will re-consider this matter at their October meeting. The dimensions, as settled, are believed to be entirely incompatible with the prospective demands of the business, and it is therefore proposed to examine the question.

The Canal was originally constructed 4 feet deep, and the water has subsequently been raised from 3 to 9 inches generally. The boats draw usually 2½ feet, and rarely exceed 32 inches, and carry an average burthen of about 35 tons. To raise the water from 15 to 21 inches is, therefore, all that will be practically obtained in additional depth over the present water. It may be asked, why do not the boats draw a greater depth? The reason is, the sand and mud that is deposited in many places on the bottom of the Canal, forms bars that are liable to ground boats of greater draft, and the delay to which boats of deeper draft are subject to, prevents their general adoption. As a further reason, it is generally believed that boats do not manage as easily when drawing near the bottom. The Board propose to lengthen the chamber of the locks 15 feet, which will increase the capacity of the boat. It must be kept in mind, that a small boat may navigate a Canal of less comparative dimensions than a larger one. A small boat may be controlled and its direction more readily changed in the danger of contact with other boats, or objects against which it is liable to run, than a larger one; consequently the large boat requires more liberal proportions in the Canal it navigates.

The present Canal is adapted (as appears by a table in the report of the Canal Com-

missioners) to boats of about 30 tons burthen, to afford the most favorable traction at a moderate velocity, and a Canal of about 6 feet deep, 60 feet wide, and locks of 105 feet chamber, (as directed by the Canal Board,) would by the same calculation be suitable for boats of about 70 tons burthen. But the Erie Canal boats are estimated to average about 35 tons, and in some instances boats have carried 50 tons. Judging from the usual practice on the present Canal, connected with the fact that a large boat will require more proportioned dimensions in the Canal, we are not warranted in calculating the enlarged Canal as adapted to boats of more than 70 tons burthen, or double the present capacity; and when the locks are doubled equal 4 times the present capacity with single locks. Is this calculation at all commensurate with the prospective magnitude of the trade to be accommodated? The Canal Committee in their report recommend such a Canal as will accommodate boats of 120 tons burthen; and by a table given in their report, as also in the report of the Canal Commissioners, it appears that a Canal adapted to the most favorable navigation of boats of 130 tons burthen, requires 8 feet depth of water and 80 feet width at surface. But the dimensions settled by the Canal Board will only be sufficient for about half this burthen. Now, it is not pretended, such a Canal will not float a larger boat, nor that a larger one could not be navigated; but it is settled by the rule of calculation referred to, that such a size is necessary, for the most economical and convenient navigation. This is also corroborated by experience on the Erie Canal, when the average load exceeds the rule of calculation only about one sixth; and it is apparent the rule should not be exceeded when applied to larger boats, if safety, convenience, and economy in the navigation, is to be secured.

In adopting a liberal plan for the boats in general use, we shall have the advantage of a navigation, that in seasons of great pressure in business, an additional 20 or 30 tons may be taken in the boat that usually carries 120 tons, a consideration of great importance.

The Canal Commissioners consider it important, as will be seen in the quotation from their report, that such dimensions should be settled as will meet the prospective demands of the trade, and thereby avoid the necessity of further enlargement: which is no doubt the correct view of the subject. The inhabitants of towns, villages, and cities on the Canal, will desire to make permanent improvements on its banks; which will render further enlargement expensive, and a severe encroachment on the established business arrangements of the country; it will be less expensive to make all necessary enlargements at one, than at two different times; and the work may be better done.

When the Canal was commenced, its success and ultimate productiveness, was, in the view of a large portion of the citizens of the state, highly problematical; and many believed it would load the state with debt, only to be relieved by heavy taxation. But the problem has been solved by experience, which now exhibits the most conclusive demonstration, and will leave us wholly without excuse, if we fail to meet the question, on the scale demanded, by the clearest evidence of its prospective magnitude and importance.

The Canal Commissioners, in their report, say, "that doubling the locks will *not* double the capacity of the Canal." This is obvious, as no lock can be placed so conveniently for the navigation as the one that lays directly on the towing-path. Boats will enter and leave this more conveniently, and with less delay than they can the 2d lock. A 3d lock should never be thought of, as the delay in passing a 3d set on the eastern section would greatly embarrass the navigation, if only one towing-path was used. The passing each other on one path, of such a number of boats as would require 3 set of locks, would produce delay and materially enhance the expense of navigation. Very little reflection is required to show, that the most economical navigation would be that which required only one set of locks, which is a further consideration for a canal of liberal dimensions, that the navigation may not be subjected to the delay incident to the necessary use of the 2d set of locks, when it is practicable to avoid it. To remedy this by a towing-path on the berme side, is considered by the Canal Commissioners, in their report, as incompatible with the accommodation of business on its borders, as also the convenient navigation of the Canal itself: We are, therefore, brought to a single towing-path and a double set of locks, as affording the maximum capacity of the canal.

From the suggestion of the Canal Commissioners and our own observation, we infer that the 2d set of locks would do about two-thirds the business of the 1st set: and if the capacity of the boat is doubled, we may estimate the entire capacity of the Canal when enlarged to 6 feet deep and 60 feet wide, in comparison with the present capacity as 10 to 3, or a fraction over 3 times.

By the report of the Canal Committee, it appears the business on the Canal has, excepting a small fraction, been confined to our own state. In view of the increased facilities that will be afforded by the enlarged Canal, in cheapening transportation, the improvements that may confidently be expected in our agriculture, the extension of our mechanic and manufacturing operations, and the tributaries that will be created by new lateral Canals, can we entertain any reasonable doubt, the business of our own state will alone double in the course of the next twelve or fifteen years? Since the completion of the Canal it has doubled in about eight years. If then the Canal is made 6 feet and 60, at the end of fifteen years we shall have it fully occupied for single locks, by the business of our own state; and the only resort to provide for further increase of our own business would be in doubling the locks; and if no other trade was to be provided for, this subject might be considered a reasonable provision. But when we look beyond the limits of our own state, and traverse the extensive and fertile regions that will naturally seek this channel as the avenue of intercourse with the Atlantic market—a district just emerging from a wilderness, and filling up with an intelligent and enterprising population,—can we doubt for a moment, that the capacity of the canal should be at least as large as will accommodate boats of the capacity recommended by the Canal Committee, to wit: 120 tons burthen. It is not necessary to enter on any contested ground, for there will be as much as we can accommodate by a Canal on the most liberal scale, that will seek this route in preference to any other, if we provide the means for its accommodation. But if our means are inadequate, still a large share will press into the Canal, and *we* must feel the delays and embarrasments it will unavoidably produce, in the *enhanced price* of transportation.

If this project was one that might load the state with a heavy debt, that could only be paid by imposing a general tax on its citizens, then, however bright might be the prospects of its ultimate utility, to those immediately interested in its navigation, there would be reason to proceed with greater circumspection in the degree to which the improvement should be carried. But on this point there is no further ground to doubt. On the contrary, there is the most ample reason to conclude that the surplus revenue will in a few years, (at most 4 or 5,) pay the difference between the cost of 6 and 8 feet depth. It is believed by men familiar with this work, that the difference between 6 and 8 feet depth and corresponding width will not be more than $4,000,000. But to provide most liberally, suppose it cost $5,000,000 more; it will not require the revenue on the present tolls, over and above its maintainance, more than 4 or 5 years, and then we shall have a navigation that may be considered good for the next 50 years. Is it wise to do less?

We do not censure the Canal Board; they have been compelled to make their decision without any expression of the wishes of their fellow-citizens on the subject; for until their decision was published, we were slumbering over this important matter. We have been informed that one of the considerations that influenced the Board was, that no public meeting of citizens or their memorial indicated the importance in which they viewed the project of enlargement. But, as before observed, the Board have left this subject with a tacit expression, that they hold it open for re-consideration in October next. Let us then lose no time in obtaining such an expression of opinion, by public meetings and memorials, as will leave the Board no ground to doubt, that to comply with the wishes of their fellow-citizens, as well as to meet the magnitude of the object, a Canal of 8 feet in depth, and from 70 to 80 feet in general width, is indispensable.

While surrounded by pressing calls of business, we have briefly called your attention to some of the considerations involved in this project, and we hope, fellow-citizens, you will take such measures as will secure your own interest, and promote the honor and prosperity of the state.

Shall a work of eminent usefulness, deeply affecting the interest of the state, fail to receive that degree of perfection which is demanded by the clearest demonstrations of its importance? It is not for the benefit, or to please the ambition of an individual, who may control the destinies of millions, to gratify a love of splendid things; but, on the simple principle of usefulness, in affording the means of easy communication to market for a numerous people, it is a magnificent project, and peculiarly demands the attention of a government that is formed for purposes of utility. The means of accomplishment are fully provided in the work itself; not the least prospect of embarrassing the state with tax to defray the cost, can be indulged. It is indeed the grand artery, through which circulates the elements of our prosperity. Shall it then be said, the people of the State of New-York have not the sagacity to appreciate the importance, or the enterprize to promote a work so deeply affecting their interest, and which at the same time is of so easy an accomplishment? They have only to say the word, and the work is done. And what will be done? Let every citizen who regards the interests or the honors of the state, read carefully the reports that have been referred to, and reflect on the importance of the project, and we feel assured that an efficient effort will be put forth to

accomplish the work on a scale that will be commensurate with its importance, and, in point of utility, will render it an imperishable monument of the wisdom and enterprise of a free people.

THE GENESEE FLATS.—We have often heard of the extraordinary fertility of these fine lands; but the annexed paragraph from the *Mount Morris Spectator*, even exceeds our previous conceptions of the extent of that fertility.

GOING AHEAD!—Mr. Editor: Please give the following a place in your paper for the benefit of the Genesee Valley farmers: Messrs. Geo. and Philo Mills have harvested this season, from twenty-seven acres of the Genesee Flat lying near this village, 1,270 bushels of wheat; threshed, cleaned, and delivered the same to B. & J. Campbell, in four days, for one dollar per bushel. Can the far-famed "West," beat this.

Forty-seven bushels of clean wheat to the acre, and that not in a small field of two or three acres, but for 27 acres, cannot, we may well believe, be exceeded, either in the "far famed West," or elsewhere.

To the Editor of the New-York American.

Dear Sir,—I observe in the American of last evening, an article taken from the Mount Mor is Spectator of 20th August, in which it is stated that on 27 acres of the Genesee Flats, P. & G. Mills, who are tenants of mine, had raised this season 1270 bushels of wheat, being 47 bushels per acre.

As this appears to have excited your surprise, and as the Mount Morris Editor has pleasantly challenged the "far West" to beat it, and as the fine lands of the Genesee Valley, at a distance from the great travelled road, are too little known, permit me to state some additional facts respecting them.

Mount Morris is in Livingston County, six miles beyond Geneseo. When there in July last, General Mills informed me that from 80 acres of the Mount Morris Flats, lying in one body, he raised the last year 3,200 bushels of wheat of best quality, and that it was accurately measured under his own inspection, being 40 bushels per acre.

The 27 acres are not of superior quality to the adjoining flats, and not equal to some of the Leicester flats on the opposite side of the Genesee river. As in your notice of the above you refer to these, as being some of the lands advertised for sale by me in your country paper, permit me to state, that, on farm No. 1, containing 400 acres, lying in Leicester, there are at least 350 acres, in every respect equal to, and on farm No. 2, containing 170 acres, more than half is superior, in quality to the above 27 acres.

From 170 acres lying in one body in number one, Dr. Wm. C. Dwight, the present tenant, raised two years since, twelve thousand eight hundred bushels of shelled corn, being upwards of 75 bushels per acre; and on number two, in the summer of 1834 he had 20 acres in wheat, in one body, which averaged 48 bushels per acre; two acres of the best of which he measured off, and of these the produce was 52 bushels per acre.

The editor states that the 1270 bushels of wheat were thrashed, cleaned, and delivered in four days. It is customary on these flats to have the thrashing machines taken to the stacks of wheat on the field, by which much labor and time are saved. Some of the large farmers there also make use of machines for cutting the grain, which are moved by horse power. With one of these, one man, with a pair of horses, can cut 12 to 15 acres of wheat between sun-rise and sun-set. The wheat as cut falls upon a platform, and connected with the machine is a revolving rake, which takes the grain from the platform, and places it on the ground precisely in the proper quantity for a sheaf; and though all that is required of the binder, is to make the bands, and bind up the sheaves, I have seen nine active binders busily employed in keeping up with the cutting machine. The work is done with not one-fourth the waste of grain, which takes place in the usual mode of cradling or reaping.

These machines of course are only calculated for fields, free from stumps and brushwood, and cost about 160 dollars each.

If you think this communication of sufficient importance to interest your readers, do with it as you please. Yours, respectfully,

B. WOOLSEY ROGERS.

September 1.

Fig. 1.

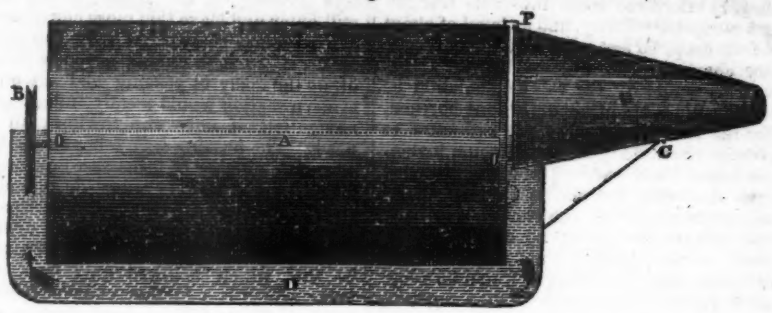
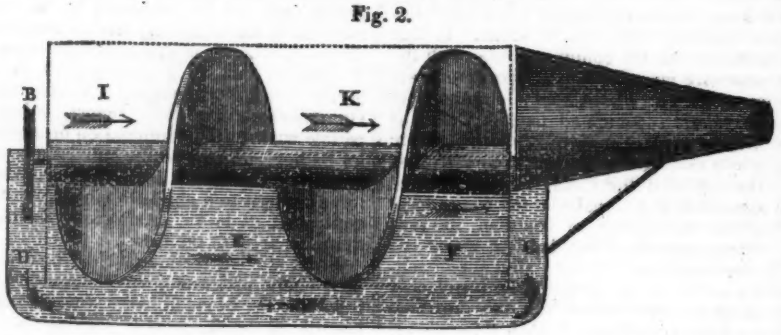


Fig. 2.



[From the London Mechanics' Magazine.]

HYDRAULIC BLAST WHEEL.

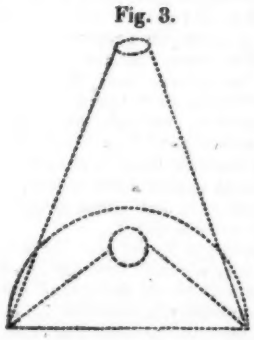
In foundries, smithies, and other manufactories, large quantities of atmospheric air in rapid motion are in constant demand, and a large proportion of the motive power is spent in the supply. The pressure of fluids being equal in all directions, the aggregate amount of force employed in transmitting air by means of bellows, air cylinders with pistons, &c. is very considerable, there being the same pressure on every square inch of the blowing apparatus as on the like space of the orifice through which the air is transmitted.

The accompanying drawings represent a blast wheel lately invented by me, of which the following is a description. I have had a model of it made, and it fully verifies the correctness of my calculations; and in this case the effects must be the same in proportion on a large scale.

Fig. 1. A is a hollow cylinder (the length of twice its diameter,) which is made to revolve on the pivots O by means of a rope or belt acting on the pulley B, or by any other mechanical power. C is a stationary nose or tube, fixed to the side of the oval trough D. The trough is nearly full of water, its level being above the centre of the cylinder A, and of the small cylinder within it, hereafter described. Within the cylinder A is a spiral leaf wound round a cylinder of about $\frac{1}{4}$th of the diameter of the external one. The size of the internal cylinder need not be increased in proportion to that of the external. The leaf is soldered to both cylinders, and so rendered air-tight; it may be made of the slightest material.

Fig. 2. The water is here seen occupying the lower half of the cylinder and trough, the top being always filled with air. On the wheel's making one revolution, the *water* in E is conveyed into F; that which was before in F escapes at G, and flows round the side and bottom of the trough, outside the cylinder, to re-enter the latter at H. The air in I (which is continually supplied by atmospheric pressure of 15 lbs. to the square inch) is conveyed to K, and so in proportion for less than a revolution;

Fig. 3.



and the air which was before in K is forced through the pipe at C, to which branch pipes may be attached. A continuous blast of air is thus produced, and may be conveyed to any part of a building. The pressure of the water being equal on all sides, and as it is set in motion by the inclined plane of the screw, but little power is required to keep the wheel going, for the particles of fluids move easily amongst themselves. The trough should be of an oval form. In order that no air may escape between the tube and the cylinder, a small strap of leather is fastened to the tube (which is fixed) to lap over the cylinder at P, fig. 1, and is kept down by a small weight, hung at the corner of each side, thus,

No air, once enclosed or detached from the atmosphere by the end H of the spiral leaf being immersed in the water, can possibly escape but through the nose or tube.

Fig. 3. Transverse sections of both ends of tube; and outline, as seen from its under side.

The wheel may be made of any size required. To ascertain the quantity of air discharged at each revolution: First, find the whole contents of the cylinder, which

we will suppose to be 14 feet in diameter, by first finding the area of the base by multiplying the square of the diameter by ·7854; then multiply the area by the length of 28 feet, thus, 14×14=196×·7854=154 nearly, ×28=4312, contents of cylinder. But as it takes two revolutions to empty the cylinder, 4312÷2=2156 feet of air and water discharged at each revolution, 2156÷2=1078 feet of air less 78 feet for internal cylinder, &c.=1000 cubic feet of air discharged at every revolution. If the motive power, or the velocity, cannot be easily regulated, a sliding-valve may be made in the side of the tube C.

ALFRED T. J. MARTIN.

Helston, Cornwall, June 6, 1835.

P. S.—Since writing the above, a practical difficulty has been suggested to me, viz. that the pressure of air for smelting should be 2, 3, and even 4 lbs. to the square inch, equal to the pressure of a column of water about 7 feet high. I do not see how this desideratum can be obtained by the foregoing plan; but still the invention may prove useful where large supplies of air are required without any considerable pressure.

[From the London Repertory of Patent Inventions, &c.]

EXPERIMENTS ON THE PRESERVATION OF SHEET-IRON FROM RUST, IN INDIA. BY JAMES PRINSEP, ESQ.—The proposed extensive employment of iron steamboats, for the navigation of the Ganges, rendered it a desideratum to ascertain what varnish or composition would best preserve the exterior surface of such vessels from the rapid corrosion to which iron is so peculiarly subject in a hot climate. A series of experiments was undertaken with this view by myself, at the requisition of government; and it may perhaps be useful to record the principal results in a journal of science.

Two sets of six wrought-iron plates, each measuring 3 feet by 2 feet, were fixed to two iron triangles, the plates being prevented by studs from coming into contact with each other. The same varnishes were applied to both sets, one being intended for entire submersion under water, the other to be only half immerged, in order to [that it might] feel the united influence of air and water.

The following were the coatings applied:

1. Common coal-tar laid on hot, and the plate heated.

2. *Thetsee* varnish of Ava, one coat. This took a very considerable time (two months) to dry, kept first in a cool room, and afterwards in a room heated by furnaces.*

3. Native *Dhuna*, applied to the iron hot, in a thick uneven coat.

4. Best white-lead paint, three coats; allowed to dry and harden for nearly three months.

5. Coachmakers' varnish, two coats; dried rapidly.

6. Spirit varnish, several coats; warmed.

7. White wax, melted on the surface.

8. White wash, of pure lime water.

9. The surface of the iron plate cleaned and guarded with an edging of zinc, soldered on.

10. The natural surface of the rolled iron sheets, covered with its usual hardened grey oxide.

Many of the foregoing were employed from curiosity only, especially No. 6, the spirit varnish, which had, on many occasions, proved quite ineffectual in preserving the surface of polished iron and steel from rust in the atmosphere of Calcutta.

The two frames were suspended as above described, one under water, the other half immersed, from one of the unused dredging boats, near the Chitpur lock gates, in the circular canal, where they were left undisturbed for three months, during a period of the year when the water of the canal was only slightly salt.

They were then taken up for examination, and presented the following appearances.

Plates under water.	Plates half above water.
1. Tar—Perfectly preserved and free from rust.	1. Tar—A few dots of rust between wind and water.
2. Thetsee — Perfectly uninjured in appearance.	2. Thetsee—A line of rust at the level of the water.
3. Dhuna—White and pulverulent; soft and easily rubbed off while wet: rust here and there.	3. Dhuna—Large cracks from the contraction of the part exposed to the sun, whitened where thick, black where thin; plate preserved above water.
4. Paint—Almost wholly disappeared, and blotches of rust on the surface.	4. Paint—Paint uninjured above water mark, and plate preserved, but below water entirely removed.
5. Copal varnish—Whitened, pulverulent, and soft; but not much oxidated.	5. Copal varnish — In air less whitened, spots of rust breaking out every where.
6. Spirit varnish —— Whitened and very rusty.	6. Spirit varnish—Very much corroded.
7. Wax—No trace of wax left, and very rusty.	7. Wax—This plate was all under water.
8. Lime—Flaky, peeled off, and very much corroded.	8. Lime—In air remains on and acts pretty well.
9. Zinc—The clean iron excessively corroded and bad: the zinc also oxidated.	9. Zinc — Much more rusty in the air than under water, where a kind of crust was formed.
10. None—The natural surface was a little whitened, and pretty well preserved.	10. None—Rusty on the edges, or where it had been scraped; elsewhere little injured.

The superior preservative power of coal-tar to all the substances tried, with the exception perhaps of the thetsee, was evident; the Burmese varnish labored under the disadvantage of being a single coat, otherwise it would, doubtless, from its hardness, its firm adherence, and its inalterability by water, prove fully equal as a lacquer to the coal-tar: the latter has, on the other hand, the advantage of drying and hardening as soon as laid on.

The change effected on the resinous varnishes is produced by an actual chemical combination with the water; the soft pulverulent matter is analogous to the white powder obtained by the addition of water to an alcoholic, or to an acid solution of resin.

The failure of the zinc guard, which was expected to act as an electro-positive protector to the iron, may, I think, be attributed to its being adulterated with lead, which being negative with respect to iron, would cause, as was actually the case, a more rapid oxidation of the latter metal: (the impurity of the zinc was afterwards fully proved.)

The wax and the white paint had entirely disappeared from the surface of the metal under water, before the plates were taken up; it is impossible, therefore, to say in what way their removal was effected.

The bituminous (coal-tar) coating was finally adopted, and it has been successfully applied to the iron steamer, the Lord William Bentinck, lately launched under Captain Johnston's superintendence.—[Journal of the Asiatic Society of Bengal.]

CHEMICAL EXAMINATION OF THE PETROLEUM OF RANGOON.—By ROBT. CHRISTISON, M. D., F. R. S. E., Professor of Materia Medica in the University of Edinburgh, &c.—At the close of the preceding session, the Council of the Society did me the honor of entrusting me with the chemical examination of several articles sent not long ago to the Society by Mr. Swinton, Secretary to the Government at Calcutta. The articles in question are, 1, Specimens of the *black varnish* used in different parts of Hindostan and the Burmese territories, with specimens of the juices of which these varnishes are said to be compounded. 2, Specimens of *naptha* from Persia, and of *petroleum* from Rangoon. 3, Specimens of *wood-oil*, a variety of fluid turpentine. 4, Specimens of crude *caoutchouc*, and of solutions of it in wood-oil.

The only one of these articles which has hitherto yielded results of such interest as to induce me to lay them before the Society, is the petroleum of Rangoon, which appears to contain a compound inflammable principle hitherto unknown.

The petroleum of Rangoon, termed by Mr. Swinton earth-oil, and more generally in the East, ground-oil, is probably the same with what may be procured in various parts of our eastern dominions, by merely digging a few feet into the soil. In the vicinity of Rangoon it may be obtained in immense quantity for the mere trouble of digging it. It is used in Hindostan as pitch for all manner of wood-work; and is likewise a favorite external remedy for rheumatism, being employed for that purpose in the way of friction.

I am not aware that either this, or any of the European petroleums, has been subjected to careful analysis; and I should suppose no such analysis has been made, because no chemist, even with a careless examination, could have failed to observe that it contains a peculiar principle, the discovery of which would have given the analysis publicity.

The petroleum of Rangoon, at ordinary temperatures in this country, is a soft solid, of the consistence of lard. Its specific gravity, at the temperature of 60° Fahr., is 880, water being 1000. At the temperature of 86°, it is of the consistence of thin paste, and at 90° it melts completely, and forms a sluggish liquid,

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*Major Burney states, that three or four days are sufficient for the varnish to dry when laid on wood (Journal, vol. i. p. 172). I had not a damp vault in which to expose the plate as recommended by that officer, and that may partly account for the delay in drying; but all varnish and paint takes longer to dry on metal than on wood, from its non-absorbent nature.

which acquires more fluidity as the temperature rises. Hence in the East, durring the hot season, when it is dug for, it must be in the fluid state, and consequently entitled to its vulgar name of ground-oil. It has a powerful naphthous odor, different from that of most other petroleums.

It is impossible to analyze this petroleum by means of the ordinary chemical solvents. Most of these solvents, such as the acids and alkalies, have little or no action on it, while alcohol, which acts feebly, and ether and the volatile oils, which act energetically, dissolve all its principles indiscriminately. The only practicable method of analysis, therefore, is the process by distillation.

When six ounces of petroleum were distilled, there was first procured, at a low heat, an ounce of nearly colorless naptha; then another ounce of straw-yellow naphtha; then, at a higher heat, about another ounce, much more yellow, yet still fluid at 60° Fah.; next, a considerable quantity of a yellowish liquid, which concreted at 60° into a loose mass, composed of numerous crystalline needles and plates, in a yellow naphthous fluid; and, as the distillation went on, this matter became more and more solid, but even towards the end was not firmer in consistence than lard. The residual matter in the retort, when the heat had been raised to full redness, was a spongy charcoal.

The naphtha, when rectified by a second distillation over a lamp, and then by a third distillation from the vapor-bath, is limpid and colorless, like sulphuric ether, and its density as 779. From the trials I have made, I consider that the Rangoon petroleum, when distilled on a large scale, will yield nearly a third of its volume of this colorless naptha.

I need scarcely observe, that in eastern countries, where the fresh juice of the caoutchouc tree cannot be procured, the naptha from the Rangoon petroleum may prove a useful article. Like other kinds of naphtha it freely dissolves, or rather softens, caoutchouc; which, after the evaporation of the solvent, is recovered with its original properties. When it is to be used for this purpose, however, it must be carefully separated by distillation from the crystalline matter I am presently to describe, which rises as the distillation advances, and gives the naphtha a yellow color. For if any material proportion of this impurity be present, the caoutchouc solution dries very slowly, and long retains a greasy surface.

The yellowish, concrete, crystalline matter, like the petroleum itself, is not acted on by the caustic alkalies, or by the strong acids. Alcohol dissolves it very sparingly; ether and the essential oils, freely and entirely. None of these solvents, therefore, is of any use for separating the crystalline matter from the mass. But I have succeeded in procuring it in a state of purity by the following process:

The mass being cooled down to about 40° Fahr. it was spread out on the filtering paper, and then subjected to strong pressure between many folds of common blotting paper. In this manner, an oily-like matter was taken up by the paper, and a pale yellowish white crystalline substance was left, which was subsequently deprived of its remaining color by repeated solution in boiling ether and recrystallization. Ether dissolved it largely, forming a pale yellow solution, which, on being cooled by immersing the vessel in very cold water, became a soft mass of interwoven crystals. This mass was then taken out, spread quickly on filtering paper, and immediately subjected to strong pressure between folds of blotting paper. The yellow coloring matter, which all remained in solution in the ether after it cooled, was thus, in a great measure, imbibed by the paper; and the crystalline matter was procured in a state of purity by repeating this process twice.

On first procuring this crystalline substance, I considered it as the same with the napthaline procured not long ago from coal-tar by Mr. Kidd, as related in his paper in the Philosophical Transactions for 1821. This opinion I was led to form from the appearance of the crystals, the nature of the substance which yields them, and the process of distillation by which they were procured.

On a careful examination, however, I find that the crystalline principle of petroleum differs materially from that of coal-tar, as well as from every other known body; and I shall therefore beg leave to denominate it *Petroline*, according to the analogy suggested by the name of Mr. Kidd's crystalline principle.

As procured by the process described above, petroline forms foliaceous masses of small crystals of snowy whiteness, and bright pearly lustre. It is somewhat unctuous, and has a naphthous odor, which becomes very faint on exposure for some time to the air, and is removed altogether by boiling in alcohol. It fuses at 135° into a transparent, limpid, colorless fluid; but softens ten degrees lower. From a state of fusion it concretes on cooling into a translucent brittle mass, like wax, the density of which is 909 at 60° Fahr. At a temperature intermediate between the boiling point of water and a low red heat, the fluid boils, and distillation takes place. The greater part of the petroline condenses in the form of a fluid, which becomes, on cooling, a translucent waxy mass, with its original properties. But, owing to the elevated temperature required for its distillation, a part is decomposed, a little charcoal is left behind, and a small quantity of inflammable gas passes over with the undecomposed sublimate. When heated in the open air, it catches fire, and burns with a dense white flame and much black smoke.

Petroline is insoluble in water, cold or boiling. Boiling alcohol takes up a small quantity, not more than a 450th of its weight, and, on cooling, deposits the greater part in minute shining crystals. Boiling ether, its proper solvent, easily takes up a fifth of its weight, which, on cooling, is in a great measure separated in a congeries of micaceous crystals, so abundant as apparently to convert the ether into a solid mass. Oil of turpentine also dissolves it in large quantity, and so does naphtha.

Caustic potass and caustic ammonia in solution have no visible effect on this substance. When boiled with it, it simply fuses, rises to the surface, and is there found, on cooling, with its usual properties. Concentrated muriatic, nitric, and sulphuric acids, are equally without action, even when aided by the heat necessary to boil each. It simply melts and rises to the surface, and, except that it becomes slightly yellow with nitric, and slightly brown with sulphuric acid, no change of property is perceptible. It has no action with acetic or oxalic acid.

With iodine, aided by a gentle heat, it quickly unites, forming a violet-colored fluid, which, on cooling, becomes a dirty greenish-brown solid, very soluble, like each of its elements, in sulphuric ether.

I have not made any inquiry into the other chemical relations of petroline, my object at present being merely to establish its claims to be considered a new principle, distinct from any other hitherto known. In its properties it resembles napthaline more than any other substance; but, at the same time, it differs from that body in very many respects. Naphthaline volatilizes at common atmospherical temperatures; does not fuse under 180° Fahr.; and, when heated a little above 400°, boils and sublimes in fine micaceous crystals. It is heavier than water. It forms a rose-colored solution with acetic or oxalic acid; and with sulphuric acid it unites to form a peculiar acid, termed the sulpho-naphthalic, which, like other acids, neutralizes bases, and forms salts with them. A single glance will satisfy every one how completely this account of the properties of naphthaline differs from the description given above of the properties of petroline.

It remains for me to determine its elementary composition. This I have not hitherto found leisure to accomplish; but I am engaged in the requisite experiments at the present moment, and will soon make them known to the society. The experiments hitherto made merely enable me to say, that it contains a very large proportion of carbon.

Appendix, December, 1834.—A few months after the preceding paper was read before the Royal Society, the author observed in Buchner's Repertorium, an account of the discovery in 1830, by Dr. Reichenbach, of a crystalline principle in tar, to which that chemist gave the name of paraffine. As the properties of paraffine seemed from that account to be obviously identical with those of the petroline of the Rangoon petroleum, and as Dr. Reichenbach had ascertained its properties and composition fully, any farther investigation of the crystalline matter of petroleum appeared unnecessary. The original paper is now published, partly because allusions have been made to it in chemical works, and partly to serve as an introduction to the ulterior inquiry of Dr. Gregory on the same subject.

The author, soon after laying this paper before the Royal Society, examined by

the same process the petroleum of St. Catherine's, near Edinburgh, of Rochdale, in Derbyshire, and of the island of Trinidad; but was unable to detect a similar crystalline principle in any of them.—[Transactions of the Royal Society of Edinburgh, Vol. xii., Part i., p. 118-123.

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On the Fusion and Appearance of Refined and Unrefined Copper. By David Mushet, Esq.—The following are "a few extracts from experiments made some years ago, with a view to ascertain what effect would be produced upon the strength and malleability of copper, by retaining, to a certain extent, the alloy (chiefly tin) which is found in rough copper, and which it is the purpose of the copper refinery to discharge. In the first place, I obtained a quantity of shotted rough copper, made from the furnace in which the copper, though alloyed with other matters, first appears in its metallic form. These shots were light and flaky, hard when struck, but at the same time partially ductile. A quantity of pure shotted copper, made from the refinery, and having the form of flattened spheroids, and much denser than the other, was procured at the same time for the purpose of these experiments.

Exp. No. 1. A quantity of rough copper was fused in a black-lead crucible with nearly an equal bulk of charcoal, and poured into an open iron mould. The bar or ingot thus made was three-fourths of an inch thick, and when cold and broken, was found to have crystallized in converging striæ perpendicular to the upper and lower surfaces, and declining towards the outer edges of the bar. The grain was of a pale color inclining to gray, indicating the presence of tin.

Exp. No. 2. Three bars procured in this way were melted together in a black-lead crucible, without charcoal, and poured into a mould just at the moment when the melted copper put on a creamy appearance. When cold, the surface of the ingot thus obtained was less copperymetallic than the surface of the ingot in the first experiment, where charcoal was used; from which it may be inferred that, owing to the absence of charcoal, a certain degree of refinement had taken place. The fracture possessed more of the red grain of good copper; the striæ were less distinct and less crystalline; and the surface, instead of being convex, as in the first experiment, was concave.

Exp. No. 3. Some of the pure shotted copper was fused in a black-lead crucible with an equal bulk of charcoal, and the resulting ingot presented a more clean and perfect mass of copper than the ingots obtained in Experiments No. 1 and No. 2. The fracture presented a series of brilliant striæ arranged from surface to surface, breaking off easily in the direction of the perpendicular fibre, a structure which seems wholly incompatible with extension or malleability.

Exp. No. 4. Some of the same pure copper melted similarly, but not poured into the mould until it had nearly lost its fluidity, formed an ingot less striated or crystallized than any of the former, with more of that minute deep orange-colored grain which is peculiar to pure and malleable copper. From the results of this experiment, and of No. 2, it would seem that when copper is poured into the mould at as low a temperature as is consistent with perfect fluidity, the fracture is less crystallized, and the color approximates to that ruby grain which indicates the malleable state of copper.

Four bars, one from each of the foregoing experiments, were imbedded in burnt lime, shut up from the access of air, and exposed in crucibles to the same temperature. The pure copper bars (Nos. 3 and 4) were on the surface considerably oxidated, but those made from the rough copper (Nos. 1 and 2) were entirely free from oxide; and from this it may be inferred that the alloy (principally tin) which still remained in the copper, prevented waste or oxidation. The bar from Experiment No. 1 was not cut, but that from Experiment No. 2 retained about the same quantity of grained striæ as before the cementation; though, compared with a fracture of the same copper that had not been cemented, the grain was redder, the color more brilliant, and the metal more ductile. The bar from Experiment No. 3 was covered with a thin coating of crystallized oxide exceedingly soft; the striæ were more enlarged and adhesive, so that the copper, in cutting, tore out in flakes, which separately were soft and ductile. The bar from No. 4, when examined and compared with an uncemented one, was more open in the grain, redder, and more brilliant; but the quantity of depth of grain was nowise altered, although the metal cut softer, and was covered with a thin crust of shining oxide. From these details it may be presumed that cementation opens the grain, renders the bar less dense, but does not change the peculiar form of the arrangement. In each case, the copper after cementation was softer, a change which seems favorable to rolling cold. The impure or rough copper appears to be alloyed with another metal (no doubt tin,) which prevents that oxidation which pure copper in the same circumstances would undergo.

Besides the above, several bars were made from the rough copper by a slower fusion, and with a longer exposure to the charcoal, and it was observable, that the longer the exposure, and the slower the fusion, the more yellow and refined was the copper in the bar.

Some of the bars produced in the course of these experiments were attempted to be rolled; but the success was various. Of those made from the pure copper, some rolled better and others worse than any made from the rough copper; one or two bars of the latter were equally malleable with the former; but none rolled well either hot or cold. In those bars in which the striated arrangement was most perfect, the capacity for rolling was least, and those in which the minute granular fracture prevailed, generally rolled the best. It certainly does appear that this tendency to crystallize, so destructive to malleability, is peculiar to English copper made from the crucible. There are occasions, no doubt, when, the proper temperature being hit upon, the bar would roll; but these occasions are so rare and uncertain, that English copper made in this manner could not be relied upon in the manipulations connected with manufactures. There is no question that the arts in this country suffer from the peculiarity of English copper. For, in consequence of it the malleabilization of that metal is necessarily confined to the original process of refining practised on the great scale by the copper smelters. It is very different with Swedish and Russian copper, which I have seen melted in considerable quantities in large crucibles, cast into cakes or thick sheets, and afterwards rolled into boiler-plate and thin sheet-copper. This subject requires and deserves a scrutinous examination, with a view to discover the cause of the uniform tendency of English copper to crystallize; and that cause may, perhaps, be found in the process employed in this country for the smelting of copper ores, a process which, however economical and well calculated to overcome quantity, has never yet produced pure copper.—[London and Edinburgh Philosophical Magazine, May, 1835.]

[From the Journal of the Franklin Institute.]

Abstract of the Specification of a Patent for a Mode or Machine for making Wrought Nails, Tacks, or Spikes. Granted to Wm. C. Grimes, *York, York county, Penn., Dec.* 17th, 1834.

To make wrought nails by machinery is an object that has been sought by numerous individuals; hence it may be useful, in order to point out more clearly the novelty in the present plan, to refer to the general principles upon which preceding machines, or processes for that purpose, have been founded.

One of the first, and it is believed, an almost universal principle, that has been observed in previous attempts to make wrought nails, has been to make them from rods that were rolled or slit to the size of the larger part of the body of the nail. To taper, or to give to the nail its requisite form, from such rods, various modes have been essayed; swaging, forging, and rolling, have been tried, but the latter by far the most generally. Modifications of these principles, to effect the object proposed, have been too numerous to be here detailed. But whatever has been the modification of the machine, it has generally embraced or been constructed to operate upon only one of these principles. The novelty of the present machine consists in its being constructed so as to combine several of these principles at the same time, viz. cutting, swaging, or pressing, and forging, or percussion, and to make the novelty more apparent, the nails, &c. are not to be made from rods of the size of the body of the nail, but from broad plates, and these at a

red heat. These plates are to be prepared by rolling, after the manner of plates for cut nails, but with this difference—they must be of perfectly sound iron, and two or three times as broad as the length of the intended nail, but of about the same thickness. These plates are to be cut off transversely into pieces, about two-thirds the length of two nails. From the sides of these pieces, or plates, the nails are to be formed and cut, the length of the nail running with the grain of the iron, or parallel with the length of the original plate. These plates are held, turned over, and the nails cut from the sides or ends of them, in the same manner as is practised in making cut nails, but with this difference—in making cut nails, the plate is either cold, or at what is called a black heat, whilst in my process the plates are to be at a high red heat. In making cut nails, they are cut off with a regular taper from end to end; in this process they are tapered not more than half their length. In making cut nails, the width of the plate is the length of the nail; in this process the plate is cut into lengths transversely, which length forms two nails, by their points overlapping each other. In making cut nails, the first action upon the nail is to sever it from the plate; in this process the nail is nearly formed before it is severed from the plate.

As the plates are cut at a high red heat, they would soon destroy the temper of the steel cutters or dies, if continually applied, as in making cut nails; therefore, to prevent such injury, I cut a few nails in rapid succession, and then allow a short intermission, when the plate is withdrawn, and a jet of water is applied for an instant to the dies, which continue in motion, the plate and the jet of water being applied alternately to the dies.

Two or more of these plates should be in the fire at a time, as only a part of one plate can be cut or formed into nails without re-heating. The plates may be changed in the furnace during the time that the jet of water is let on to the dies.

The water in the pipe that conducts it to the dies should be under considerable head, or pressure, and the starting and stopping the jet may be done in various ways; the valves or cocks may be opened at regular intervals by the machinery, or a treadle may be applied for that purpose.

When the nail is to be formed and cut from the plate, such a portion of the latter as shall be necessary is placed between the jaws or dies, constructed for the purpose, and which are parallel with the end or edge of the plate, for about half or two-thirds of the length of the nail. The remainder of the dies are turned off at a slight angle, running out to the edge of the plate, thus forming the taper or point of the nail; the plate is then turned over, and its opposite side brought into the same position between the jaws, and another nail is cut, the point of which commences at the same point in the plate that the taper began in the preceding nail.

A heavy hammer for striking a head upon the nail is placed in front of the end of the jaws; this hammer is fixed upon the end of an upright rod, or helve, the lower end of which is fixed to a horizontal shaft, furnished with round tenons, or gudgeons, that work in suitable boxes on each side of the frame of the machine. From the side of this shaft, an arm projects, being inclined downwards; this arm may be about one-third of the length of the said helve. A beam or lever, whose fulcrum is near its centre, lies nearly in a horizontal position, with one end beneath the fly-wheel, and the other above the said short arm, to which it is jointed by a link. A cam on the periphery of the fly-wheel acts upon the end of this lever, or beam, the latter being gradually borne down by it, while the opposite end of the beam rises, and by its aforesaid connection with the hammer, the latter is thrown back to a proper distance; the said cam then terminates abruptly, and by a strong spring the hammer is brought forcibly upon the iron which is to form the head of the nail.

I intend sometimes to form the head upon the nail by pressure, instead of percussion.

Any competent power may be employed to impel the machine.

Machines greatly differing in form, and in the particular arrangement of the respective parts, may be constructed upon the preceding principle to produce similar results, or effect the same end by similar means. I therefore do not intend to limit myself to the particular arrangement herein specified, but to change such form and arrangement as I may think proper, while the principle remains unchanged.

What I claim as new, and as my invention, and for which I ask letters patent, is, 1st. The making or forming wrought nails, tacks, or spikes, from or upon the edges or sides of metallic plates, by pressure and cutting, after the manner, or upon the principle, herein specified.

2d. The manner of severing the plate from the nail, so that a part of the latter is left standing out beyond the end of the jaws as herein before described.

3d. The side jaw by which the plate is gauged, and the nail compressed, and removed from the jaws.

4th. I also claim the general construction and combination of the respective parts of the above described machine, by which general combination it derives that character by which any competent machinist will readily distinguish it from any of the various nail machines heretofore in use.

But I do not claim as my invention the fly-wheel, cams, levers, or any other part of the machine, taken separately and individually; but, as aforesaid, the combination of these parts upon the principle herein fully set forth. Nor do I claim the forming of nails from nail plates, by cutting them with the grain, that having been already done; but in this particular I confine myself to the peculiar manner in which the cutting is effected. WILLIAM C. GRIMES.

[From the same.]

Abstract of the Specification of a Patent for a mode of manufacturing Wrought Nails, Tacks, or Spikes, by first preparing the material, rod, or pieces, from which they are to be made, in such a manner as greatly to facilitate the process of making them, and then operating upon the pieces so prepared by means of a machine particularly adapted to that purpose. Granted to WILLIAM C. GRIMES, *York, York county, Pennsylvania, December 17th,* 1834.

The metal is first to be rolled or slit into rods, but not of the exact size and form of the body of the nail to be made, but they are to be broader one way, and thinner the other, the rods being usually about twice as broad as they are thick; the width and thickness of the rod, or piece, however, being such that, when it is staved, swaged, or compressed upon its sides, or edges, enough to bring it into a square form, it shall then be of the requisite thickness for the body of the nail, tack, or spike. The rod is to be cut off into the proper lengths for the nails, tacks, or spikes; they are to be cut square off at one end, the other being cut very obliquely across the rod, thus giving the requisite taper for forming the point to the nail, &c., which taper will be greater, or less, according to the obliquity of the cut across the rod. The nails, tacks, or spikes, so prepared, may be finished by various methods, as by forging, swaging, or compression; and the machinery to operate upon either of these principles, to effect the same end, is susceptible of an almost endless variety of modifications.

The machines that I have adopted for the purpose are made to operate upon the principles of swaging and compression, and are constructed as follows. The prepared piece is let or dropped into the upper end of an angular trough, or gutter, which stands inclined from a vertical line about thirty degrees, (more or less.) The trough consists of two flat sides, joined at right angles, the angular point being downwards, so that, if the trough was placed in a horizontal position, its sides would rise at an angle of forty-five degrees from the horizon; the piece that forms this trough, or gutter, is the ridge, or rather one corner, of a triangular frame. Swages, or hammers, strike or act upon different sides of the nail as it descends along this trough, or gutter; these swages are placed in pairs, each pair striking upon the nail within the trough alternately, and consequently upon its different sides; their helves, at their outward ends, are jointed to the two lower angles of the frame, and in such position that they operate at right angles with each other.

The piece for the nail, &c., when dropped into the gutter, slides down to a moveable piece, or stop, that rises through the bottom of the trough, which arrests it for a moment, or until both swages have operated, when this stop recedes, and the piece instantly slides down until it is arrested by a similar

stop, and is again struck by two other swages, and so on through any required number; three pair will, I apprehend, be sufficient in all cases. The last pair of swages, which are at the lower end of the trough, or gutter, fall upon, and gripe the nail, while a heavy hammer, from below, strikes upon and heads the same. The heading hammer, swages, and stops, all receive their motion from cams fixed upon a revolving shaft, running up through the triangular frame. Two or more nails may be passing down the angular trough at the same time, as the stops, after allowing a nail to pass, immediately resume their position. The swages, hammer, &c., after being raised by the cams, are forced back upon the nail by suitable springs.

I intend sometimes to form or finish the nails by pressure, which is effected in the following, or in a similar, manner. The machine, when intended to finish the nail by pressure, is to be made, generally, like the preceding machine, but the triangular frame will be much shorter, as there will be the lower pair of swages only, the inclined trough, or gutter, having a single stop. The action upon the nail, &c., is to be very similar to that before described, being alternate, and upon different sides, but it is to remain in the same place till finished. After a few reciprocating or alternating motions of the jaws, one or both of them close or press upon the nail, and hold it whilst there is a head pressed upon it. In forming some nails, the alternating motion of the jaws may be unnecessary, as they may close upon the nail at once, and form it sufficiently by this single pressure.

There should be two pairs of shears for cutting off the rod, whether it is cut hot or cold; the cutting edges of these stand at right angles, or nearly so, but both pairs may be fixed upon short arms, standing out from a strong vibrating, or semi-revolving, shaft; one pair to cut the rod off obliquely, and the other pair to cut it square. The two troughs, spouts, or gutters, into which the nails fall from the respective shears, may both lead to the same point, and terminate in one groove, or gutter, before it reaches the machine below.

I intend sometimes to cut the pieces for the nail from plates, instead of from rods. The plate should be of sound material, and rolled much broader than other nail plates. These plates are to be cut off transversely into pieces about two-thirds the length of two nails; from the sides or edges of these plates, the pieces for the nails are to be cut. The plate is to be held and turned over at each cut, in the manner followed in making cut nails, the length of nail, however, being only about two-thirds of the width of the plate; the shears being bent into such form as to run off to the edge of the plate; the piece thus cut off is brought to an acute point, being tapered less than half its length; the taper, or points, of the nails overlapping each other in the plate. This plate should be at a red heat when the nails are cut from it, if they are to pass directly into the machine; or they may be cut off cold, and afterwards heated and fed to the machine, as before specified.

What I claim as new, and as my invention, in the before described mode of preparing the pieces, or material, for wrought nails, and in the machine for finishing them, and for which I ask letters patent, is—1st, The cutting the rod obliquely, in the way described, to form in part, or wholly, the taper of the nail, tack, or spike, whereby mere pressure, or swaging, will suffice to finish the nail, &c.: the rods being broader one way, and thinner the other, than the body of the intended nail.

2d, I claim the manner of preparing the pieces for wrought nails, tacks, &c., to be finished in my machine, by cutting them out of plates of metal, as herein before shown. I do not claim the cutting with the grain of the metal generally, that having been previously done, but confine myself to the cutting into the form, and for the purpose, described. I claim the forming or finishing nails, tacks, or spikes, or other metallic articles, by swaging in, or as they descend an inclined trough, or gutter, after the manner, or upon the principle, herein before specified.

3d, I claim the finishing of nails, or similar articles, after being prepared as herein before shown, by alternate or simultaneous pressure, after the manner, or upon the principle, before specified.

WILLIAM C. GRIMES.

VISIBILITY OF STARS IN THE DAYTIME.—Sir: On the 384th page of vol. 3, of the Scientific Tracts, I have noticed an article relative to the "Visibility of Stars in the Daytime." In answer to a request at the close of that article, I send you the following extract, from "Lecons d'Astronomie, par M. Arago, imprime a Paris, 1835."

"It is a very common error to suppose that stars can be seen in the daytime, from the bottom of pits, or wells. They cannot be seen during the day, only by the aid of telescopes, or by rising high in a balloon, or from the summits of lofty mountains. The cause which prevents their being seen with the naked eye during the day is, that the rays of the sun, reflected by the atmosphere, form a luminous veil, which obstructs the feeble light of the stars. If one body emits less than one-sixtieth as much light as the other, it becomes invisible. This can be verified by a simple experiment: place an opaque body between two lighted candles, so that the body will project two shadows; remove one of the candles so far that the light it throws upon the opaque body shall be only one-sixtieth as great as the light from the other candle. This is easily done, if we remember that the light diminishes as the square of the distance increases. The shade produced by the most distant light will no longer be visible. This is the principal reason why stars can be seen with a telescope in the daytime; the telescope diminishes the apparent distance, and accelerates in the same degree the motion of the stars." D. — [Scientific Tracts.]

APLANATIC ENGISCOPE. — This is the name of a new instrument, on exhibition in the city of Troy. The Advertiser says, it possesses all the improvements of the microscope, from its first invention in 1612, up to the present time, and of Dr. Goring's and Mr. Prithard's Diamond and Sapphire Aplanatic Engiscope. Aquatic objects may be seen in the smallest particle of clear water, magnified to a vast extent. With the instrument one can examine the external and internal organization of the smallest animalculæ; see the motion of the fluids as they thread their way through the exceeding minute vessels which traverse in every direction the bodies of these atoms of creation, many of which are computed to be thousands of times smaller than a grain of sand, but whose bodies and all their several parts are shown by the microscope to be as perfect as those of the elephant. The skeleton larva of many of our winged insects, animalculæ in common vinegar, paste eels, dust from cheese, (which is shown to be composed of living animals,) beautiful cuttings of wood, (showing the course of the circulation of the sap,) insects inhabiting ripe oranges, &c., together with many parts of the animal creation, too small to be examined by the unasisted eye, are presented by this wonderful instrument with a distinctness which, to be duly appreciated, must be examined. In the solar and hydro-oxygen microscopes, the spectator is presented only with the shadow of the animalculæ, thrown on a whitened screen; but in this engiscope not the shadow, but the reality is exhibited. A writer in the Troy Whig pronounces the instrument to be all that is represented in the advertisement. It is said to have been constructed by Mr. Conner, a citizen of Albany.—[Ib.]

THE TOMATO.—We are such lovers ourselves, of this capital vegetable, that we willingly believe all possible good of it, and therefore circulate, as far as our columns will go, a notice, by an M.D. of its many virtues, and of different modes of preparing it.

[*From the Cleveland Herald.*]

Tomato.

In a public lecture, introductory to my course on the principles and practice of Midwifery, and the diseases of Women and Children, Hygiene, and Acclimatement, in the Medical College of the Willoughby University of Lake Erie, in the fall of 1834, in treating of the elements of Hygiene, I made the following statement relative to the *Solanum Lycopersicum*, or as it is generally called, Tomato, Love-Apple, Jerusalem-Apple, etc., to wit:

1st. That it (the Tomato) is one of the most powerful de-obstruents, of the Materia Medica, and that in all those affections of the liver, and other organs, where Calomel is indicated, it is probably the most effective, and least harmful remedial agent known to the profession. (It is an invaluable prophylactic, or preventive, against Asiatic or Asphyxiated Cholera.)

2d. That a chemical extract will probably soon be obtained from it, which will altogether supersede the use of Calomel in the cure of diseases.

3d. That I had successfully treated Serous Diarrhœa with this article alone.

4th. That when used as an article of diet, it is almost a sovereign remedy for dispepsia, or indigestion.

5th. That persons removing from the East or North, to the West or South, should by all means make use of it as an aliment, as it would in that event save them from the danger attendant upon those violent bilious attacks to which almost all unacclimated persons are liable.

6th. That the citizens in general should make use of it, either raw, cooked, or in form of catchup, with their daily food, as it is one of the most healthy articles of the Materia Alimentaria, etc. etc.

Now, as the above extracts have gone, and are going, the general round of publication, and have had the effect to awaken the public mind to an in-

vestigation of the merits of this invaluable exotic, and as the fruit is now ripe, and fit for use, in every form, it may not be amiss to make a few observations by way of addenda.

1st. In Dunglisson's Elements of Hygiene, page 300, the learned author uses the following language:

"In Europe, the *Tomato* or Love-Apple is chiefly employed as a sauce; but in the United States it is one of the most useful vegetables, although like the Potato, belonging to a family of plants some of which are extremely poisonous. The acid of this vegetable does not agree with every one; (this, however, is not confirmed by experience;) but, on the whole, it may be looked upon as one of the most wholesome and valuable esculents, that belong to the vegetable kingdom."

The same author, in his Medical Dictionary, page 305, says:

"The fruit of this, (Solanum Lycopersicum,) called Tomato or Love-Apple, is much eaten in the United States; and with the French, Spanish, Portuguese, &c., forms an esteemed sauce."

2d. The medicinal qualities of the Tomato, undoubtedly reside in one, or more, peculiar proximate principles, which are most likely of an acid nature—perhaps the *Lycopersic Acid* (if such be found to extent,) is the principal.

3d. As a *medicine*, (until a chemical extract is obtained,) it should be used raw, or in form of a sauce; as an *aliment*, the same preparations as above stated will be resorted to—the sauce and raw fruit—together with another form—its pickled state; as a *condiment*, the catchup will be made use of.

4th. Mode of preparing the Tomato for the table.

1st. THE RAW TOMATO.—In this state the ripe fruit should be plucked from the vine, and sliced up in vinegar, like cucumbers, with a little pepper and salt; or it may be eaten like other ripe fruit, without seasoning.

2d. TOMATO SAUCE.—Parboil the ripe Tomatoes until the skin will slip—peal and mash them—and add to every pound of the Tomatoes one ounce of butter, season with pepper and salt, and simmer over a slow fire until perfectly cooked. If, however, toast should be added to the sauce, the proportion of butter should be increased.

3d. FRIED TOMATOES.—Ripe Tomatoes sliced up, and fried in butter, is, to many, quite delicious.

4th. TOMATO PICKLES.—Pickles are made of the green fruit, by the same process that you would observe in the pickling of cucumbers, or other articles. The ripe fruit may likewise be pickled; and, in fact, it is the preferable article; as it is in that case highly medicinal, and has a much better flavor.

5th. TOMATO-CATCHUP, (KETCHUP.)—Take a peck of ripe Tomatoes, (or any other quantity, only observe proportions,) mash them well together, and simmer over a slow fire until they are dissolved, strain through a fine sieve; after straining, (which requires some pains by mashing and forcing the pulp through the sieve with the hand,) add to this liquid, or puly mass, half an ounce of cloves, and the same quantity of black pepper grains, one root of garlic, three ounces of horse-radish, and a sufficient quantity of salt to make it palatable; boil all these ingredients together over a gradual fire until you reduce the bulk to one half; then to each quart add two table spoonfuls of vinegar. When it is cool, cork it up in bottles and in a little time it will be fit for use. It should be placed in a cool cellar, and suffered to remain for some time, as it improves by age. The addition of some English walnut liquor to Catchup will greatly inprove its flavor.

5th. Persons seldom have a relish for the Tomato, *at first*, in any form, but when they *learn to like it*, they generally become extravagantly fond of it in all its preparations. I am satisfied that no person will be without the article, after he becomes acquainted with its virtues, and accustomed to its use.

6th. The able Editor of the Cincinnati Farmer and Mechanic, in his paper of July 30th, 1834, says—

"The Tomato is an annual introduced from South America, and is one of the many horticultural articles for which we are indebted to that country. Its stem, if supported, will rise to the height of six or eight feet, the leaves are pinnated, and have a disagreeable odor when handled. It flowers when raised in the open air, about the last of May or first of June, producing fruit in July, which continues to ripen until frost. The fruit has an acid flavor, which by use, becomes agreeable to most persons, although not always relished when first tasted. While green it makes a good pickle, when ripe it is put into soups, hashes, and stews; it is also used in confectionaries, and is an ingredient in catsup. In the United States, until within a few years, its use has been principally confined to the southern States, where it has long been a favorite. Of late, however, it has acquired a footing in the east and west, and now appears on our tables in a great variety of forms. In England it is used for soups, and is an ingredient in a distinguished sauce for mutton. In France it is in high estimation, and in Italy scarce a dinner is served, in which it is not in some form a part.

"CULTURE.—Seeds that have fallen on the ground in autumn will vegetate in the spring, and the plants thus produced, when they have attained a suitable size, may be set out, at proper distances, in a good wet soil, previously prepared. It will not be safe to rely on this method of obtaining plants. It is better to sow the seed in seed beds, about the first of April. For early plants, sow in a hot bed, sheltered with glass covers, about the first of March, and when the plants are two inches high, set them out, taking care to keep them covered when the weather is cool, particularly during cold nights.—Some few plants might be left in the hot bed, or potted and forced in a green-house. As the Tomato requires free access of air and sun to open the fruit, shade should be avoided, and the plants tied up to stakes."

I am induced to make these observations from a firm conviction, founded on long experience and close observation, that many diseases will be cured, and others relieved, in proportion to its more extensive use; and surely as a culinary preparation, it is one of the best of fashionable desserts.

J. C. BENNET, M. D.

August 21st, 1835.

A new tulip, reared by M. Patrix, a gardener at Ghent, and which the Society of Florists of the town has named the "Citadel of Antwerp," has been purchased by Mr. Vanderninck, a horticulturist of Amsterdam, who was formerly a captain in the Dutch navy, at the price of 16,000 francs.—[Paris paper.]

A statistical account of the steam-engines in existence in France, taken under the direction of the Administration des Mines, has been completed up to the end of 1833, when there were 947 steam-engines, presenting together a force of 14,746 horse power—a single horse power being estimated at 75 kilogrammes, or 165 lbs. avoirdupoise, raised to the height of a mètre, or nearly four feet to a second.—Of these engines, 759 were made in France, 144 abroad, and 44 whose manufacture has not been ascertained. This account shows that in all the years from 1827 to 1833 inclusive, the last year was that within which the greatest number of engines has been erected. These amounted to 130, of which five only were of foreign manufacture. It also shows that of the 903 engines whose manufacture has been ascertained, 334 were of low-pressure, and 569 of high-pressure. These 903 engines form the total of those which have been constructed within the last twenty years, and it is only during the last four or five years that the immense advantages of the high-pressure engines have been fully acknowledged; and, consequently, the greater number of the 569 high-pressure engines have been formed during this last period; so that the present proportion is not as 334 to 569, but as 1 to 3 or 4. However this may be, it is proved that there are now in use in France a great many more high-pressure than low-pressure engines. On the 1st January, 1834, there were in France 95 steam-vessels, besides those in the service of Government. The engines they employ are 118 in number, of which 82 are on the low-pressure, and 36 on the high-pressure principle. But it is remarked that these vessels have been built a long time, and therefore when the low-pressure principle was most in favor. Of these 118 engines which present a force of 3,480 horse power, 34 have been ascertained to be of French construction, 59 foreign, and the remaining 35 are unknown. At present the engines constructed in France in proportion to those made abroad is not as 34 to 59, but as 125 to 5. Therefore the engines on board the steam-vessels which are of foreign manufacture are of an old date, and of a period when high-pressure engines were but little used.

METEOROLOGICAL TABLE,

For the months of June and July, 1835—kept at Avoylle Ferry, Red River, Lou., (Lat. 31° 10′ N., Long. 91° 59′ w. nearly,) by P. G. VOORHIES.—[Communicated for the American Railroad Journal.]

JUNE.

Days.	Morn.	Noon.	Night.	Wind.	Weather.	Remarks.
1	71	84	71	calm	clear	light showers in the morning—wind N.W.
2	70	82	72	W	cloudy	light showers morning and ev'g—had roasting ears for dinner
3	70	83	79	calm	clear	cloudy m'g—clear at noon
4	72	86	82	..	..	
5	72	87	76	..	..	
6	70	88	82	SE	..	Red river on a stand
7	75	88	84	..	..	
8	72	77	84	S	..	
9	70	84	74	E. light	..	rain in the evening—Red river falling
10	73	81	73	calm	..	heavy rain in the even'g
11	72	78	86	SW	cloudy	clear at noon
12	71	86	74	calm	clear	
13	74	81	77	..	cloudy	rain in the evening
14	73	79	75	..	..	.. morning and noon
15	72	77	76	..	..	clear in the evening
16	71	84	78	..	..	rain in m'g—clear at noon
17	74	85	82	..	clear	
18	73	88	82	..	..	
19	73	88	86	..	..	
20	75	87	85	..	..	
21	74	86	78	..	..	
22	72	81	78	..	cloudy	clear at noon
23	73	87	77	..	clear	rain in the evening
24	72	85	79	..	cloudy	light showers at noon
25	75	82	82	..	..	rain and thunder at noon—clear evening
26	74	84	80	..	..	light showers at noon
27	77	85	76	..	..	.. .. .. —clear evening
28	79	86	83	..	clear	thunder at noon
29	72	88	84	SW	..	
30	79	88	82	calm	..	rain and thunder in ev'g

Red river rose this month, 1 foot 4 inches—and is below high water mark, 6 feet 6 inches.

JULY.

Days.	Morn.	Noon.	Night.	Wind.	Weather.	Remarks.
1	68	72	71	SW	cloudy	rain in the morning, & clear in the evening
2	62	78	70	calm	clear	
3	61	77	74	..	..	
4	70	80	76	..	cloudy	
5	71	77	73	..	..	drizzly rain all day
6	68	80	76	..	clear	Martin birds left here
7	67	82	75	SE	cloudy	thunder and rain in ev'g
8	70	84	77	calm	clear	
9	74	84	73	..	cloudy	very heavy rain in afternoon, and thunder
10	73	80	73	SW	..	very heavy rain in ev'ng
11	73	80	76	calm	..	Red river on a stand
12	73	84	75	SE	clear	thunder at'n at noon, & little rain—wind S.E.
13	73	84	81	calm	..	foggy morn'g—thunder at noon and evening
14	74	88	76	..	cloudy	thunder in the morning, rain noon and ev'ng
15	71	79	76	..	..	clear in the evening—Red river rising
16	71	83	79	..	clear	
17	72	85	82	..	cloudy	
18	73	82	72	..	..	rain in ev'ng and all night
19	70	72	70	..	..	.. all day
20	71	75	74	N. E. light	..	rain all day, and showers at night
21	72	73	72	E	..	.. ..
22	72	78	73	calm	..	rain severe in forenoon, evening clear
23	70	81	79	..	clear	thunder in forenoon, & cloudy in evening
24	74	85	82	..	..	foggy morning—clear balance of the day
25	74	86	83	..	..	.. ..
26	80	89	82	..	..	thunder, wind S.W. in ev'g
27	74	87	84	..	..	rain in ev'ng, & thunder
28	78	86	84	..	..	
29	76	89	86	..	..	
30	76	89	78	.	..	rain and thunder in ev'ng
31	75	84	82	..	cloudy	foggy morning—showers at noon

Red river rose this month, 6 inches—below high water mark, 6 feet.